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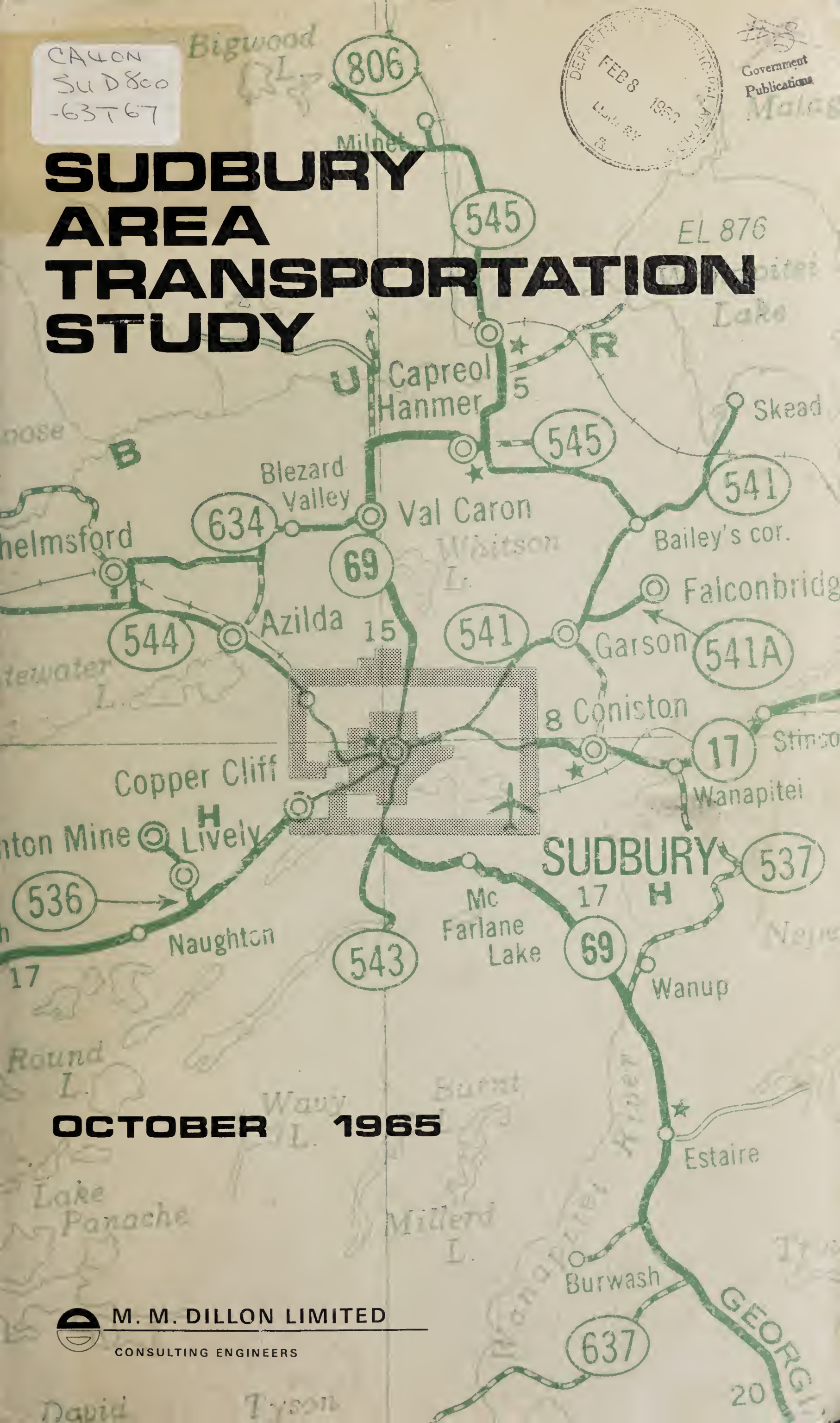

OCTOBER 1965

M. M. DILLON LIMITED
CONSULTING ENGINEERS

FEB 8 1966

SUDBURY AREA TRANSPORTATION STUDY

FINAL REPORT

OCTOBER · 1965

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October 1965.

His Worship the Mayor
and Members of City Council,
The Corporation of the City of Sudbury,
SUDBURY, Ontario.

Gentlemen:

We take pleasure in submitting herewith the Sudbury Area Transportation Study Report.

We regret the delay in completion of this assignment, which began during the summer of 1963. However, the lost time was due entirely to circumstances which were beyond our control. It seems pertinent to note that in spite of the delay, all the work authorized by the Corporation has been completed at a cost below the original upset limit fee.

It is our belief that the transportation study will provide the necessary guidance for the formulation of transportation policy within the community. Detailed technical data is presented for immediate use by several City departments. These data are essential to the continuing review and updating of the plan to serve the dynamic city growth and increasing transportation demands.

The transit portion of the transportation study, although far from being a comprehensive investigation, serves to identify the overall importance of this mode of travel. The wealth of technical data assembled as a result of the basic study should prove of considerable value following adoption of a defined municipal policy for public transportation.

We have derived considerable satisfaction from the work associated with this major assignment, and stand ready to assist or advise the Corporation as the various projects outlined herein are implemented.

Respectfully submitted,

M. M. DILLON LIMITED.

G. E. Humphries,
President and Chief Engineer.

SUDBURY AREA TRANSPORTATION STUDY

FINAL REPORT

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ACKNOWLEDGEMENTS

M. M. Dillon Limited wishes to express its sincere appreciation to the following organizations, who rendered considerable assistance to the Study:

The Ontario Department of Highways

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The Ontario Department of Municipal Affairs,

The Sudbury Planning Board,

The Sudbury Engineering Department,

The Sudbury Parking Authority,

The Canadian National Railways,

The Canadian Pacific Railways,

The Sudbury Police Department,

The Ontario Provincial Police,

The Sudbury Airport

and many others too numerous to list.

THE TECHNICAL COORDINATING COMMITTEE

The Technical Coordinating Committee was responsible for drafting the Terms of Reference for the Sudbury Area Transportation Study, and for the general direction and coordination of its progress. Its members were:

T. L. Hennessy, City Engineer, City of Sudbury, CHAIRMAN

K. Dembek, Planning Director, City of Sudbury Planning Board

G. Neilson, Parking Manager, City of Sudbury Parking Authority

W. Rodman, City Roads Engineer, City of Sudbury

W. J. Ripley, City Traffic Engineer, City of Sudbury

J. Wice, Municipal Engineer, Department of Highways, Sudbury District

G. H. Johnston, Assistant Planning Studies Engineer, Department of Highways, Downsview

M. M. DILLON LIMITED

The Sudbury Area Transportation Study was carried out by the following personnel:

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E. J. Levy, P. Eng. and J. H. Fletcher, P. Eng. (Project Engineers)

G. Savage and A. J. Van Dyke (Transportation Study Technicians)

R. F. Kidd, G. J. Ryan, Miss C. Cain and Miss J. Smith (Report Presentation)

GLOSSARY

of Technical Terms used in the Sudbury Area Transportation Study Report

ALL OR NOTHING ASSIGNMENT:

A process by which all trip interchanges which take place between two points in the study area are allocated or assigned to a single route (usually this assignment is made to the shortest route between the points). No trips are assigned to any alternative routes.

ASSIGNMENT:

The process whereby the trips between a given point of origin and a given point of destination are allocated to routes within the major street network (Assignments are usually made to the routes which provide the Minimum Distance Path or the Minimum Time Path between the origin and destination points).

AVERAGE OVER-ALL TRAVEL SPEED:

The summation of distances divided by the summation of over-all travel times.

AVERAGE SPEED:

The arithmetic average of the speeds of individual vehicles.

CENTROID:

An assumed point within an origin or destination survey zone, district or area that is judged to be representative of the centre of activity of the area. (Centroids are used in the processing of transportation data on electronic computer equipment).

COMPOSITE DESIRE LINE:

A desire line representing the aggregate of individual desire lines having a similar direction of travel or occurring in the same travel corridor. The desire line plotting of trips between all or certain origins and destinations are diverted from the straight line routing between origin and destination and are forced to pass through chosen intermediate points. This plotting procedure is used to facilitate interpretation of origin and destination data, as a pure desire line plotting for an area containing numerous centroids often produces an unintelligible scatter diagram.

CONCEPTUAL PLANNING:

The development of ideas and methods for the solution of a transportation problem. It is the process during which the findings of a transportation study are reviewed in terms of present and future needs, and solutions are devised to fulfil the requirements. The plan or plans are then tested and evaluated by network assignment, volume/capacity comparison, etc. and refinements are made as required to meet the broad goals and objectives of the study. Conceptual planning is a pre-requisite to preliminary design.

DESIRE LINE:

A straight line representing a trip between a point of origin and a point of destination drawn without regard to the actual route of travel.

DETAILED DESIGN:

The completion of all customary plans and specifications deemed necessary to guide the actual construction of a project. The detail to which plans are developed will depend to a great extent upon the complexity of the project in question.

DOWNTOWN (CENTRAL BUSINESS DISTRICT):

The major business and commercial district forming the core of an urban area.

DOWNTOWN CORDON (PARKING CORDON):

A line drawn to form the boundary of the downtown area. Most of the commercial activities and most of the parking facilities serving downtown lie within the downtown cordon.

EXTERNAL CORDON:

An imaginary line enclosing a study area.

EXTERNAL/EXTERNAL (THROUGH) TRIP:

A trip having both origin and destination outside the study area.

FUNCTIONAL DESIGN:

The refinement of a preliminary design for a project which has tentatively been selected for early construction. Several alternative designs may be refined to a point where the best design and location for the particular facility in question may be selected. Functional design should be carried out to the point where all major requirements of a project have been determined, and this ordinarily includes detailed geometrics, specific property requirements, land surveys, soil investigations and the project cost estimates.

HIGHWAY CONNECTING LINK:

The route through a municipality connecting two portions of a provincial highway. A designated highway connecting link, while it is under the jurisdiction of the municipality, usually benefits from a greater provincial subsidy than other roads in the municipality.

INTERNAL/EXTERNAL OR EXTERNAL/INTERNAL TRIP:

A trip having one terminus (origin or destination) outside the external cordon, and the other terminus inside this cordon.

INTERNAL TRIPS:

Trips which take place wholly within the study area bounded by the external cordon.

MINIMUM DISTANCE PATH

The routing between two zone, district or area centroids having the least or minimum travel distance. For an area having a large number of centroids and possible routes, the minimum distance route is usually selected by processing data on an electronic computer. The procedure may be applied to a street network or to composite desire line routings.

MINIMUM TIME PATH:

Same as minimum distance path except that both speed of travel and distance are used in combination to select the routing which represents the minimum travel time between the origin and destination of a trip.

ORIGIN AND DESTINATION (O-D) SURVEY:

The collection of information on the beginning and ending points of trips made within a study area.

POSSIBLE CAPACITY:

The maximum number of vehicles which can pass a given point on a lane or roadway under prevailing roadway and traffic conditions.

PRACTICAL CAPACITY:

The maximum number of vehicles which can pass a given point on a lane or roadway under prevailing roadway and traffic conditions WITHOUT RESULTING IN UNDUE CONGESTION OR UNDUE DELAYS.

PRELIMINARY DESIGN:

The detailing of a conceptual plan. The network proposals developed in the conceptual planning stage are related to the topography and environment of the specific area, and one or more alignments may be tested in an attempt to achieve a geometrically acceptable and economical route location. As the purpose of undertaking preliminary design is to establish the general feasibility and approximate cost of a project- or conceptual system-for comparative purposes, only general consideration is given to such items as drainage, property requirements, utility relocation and soil conditions.

PROJECTION OR FORECAST:

An estimate of the future conditions.

SIGNAL PROGRESSION:

The characteristic of a signal system which makes possible the advance of vehicles at a predetermined speed through a signal system without delay or interruption. Also, the movement of traffic itself through a signal system without interruption at a predetermined rate of speed.

SCREEN LINE:

A line dividing the study area into two parts.

TRAFFIC ASSIGNMENT:

See ASSIGNMENT.

ZONE:

A homogeneous portion of the study area used for the analysis of origin and destination data.

OUTLINE OF THE REPORT

We sincerely hope that the Sudbury Area Transportation Study will serve the City Council - and indeed - all the citizens of Sudbury, helping them to define goals and objectives for the improvement and development of the City, and indicating how their efforts may be channelized for greater effectiveness in this vital aspect of future growth.

While this report is specifically concerned with the functioning of the street system and the associated factors of vehicle operation, traffic management, parking and public transportation service, we have tried throughout out work to give full weight to other highly important factors such as Planning, Development and Control of land-use, which combine to constitute the form and fabric of the City.

To clarify the organization of this report and aid the reader, the presentation is divided into six major sections. These correspond with stages in the establishment of a transportation planning program, as suggested by the (U.S.) National Committee on Urban Transportation (see Chapter 2, Exhibit 2.A).

STAGE I - ORGANIZING FOR THE JOB

In the first two chapters of this report we offer a very brief description of Sudbury and its setting, followed by an outline of the study terms of reference and the techniques employed.

- *Sudbury is a focus of road and rail routes. Vehicles and trains from Toronto, Ottawa, Montreal and other parts of eastern Canada pass through Sudbury traveling westward to the prairies, western Canada and the United States.*

- Mining and associated heavy industries provide the economic foundation for Sudbury, although the major mines are mostly outside the City boundaries.

- *Sudbury is faced with difficult problems of topography in its existing and future development, and the rocky terrain must be constantly kept in mind when reviewing plans of the area.*

- The 1963 population of Sudbury was some 80,000 persons, and this is expected to grow to 117,000 by the year 1985.

- *Sudbury is already the regional centre for a large area of Northern Ontario: this role will be consolidated and reinforced during the 20-year planning period.*

- The Sudbury Area Transportation Study sets out to formulate a major street plan and a construction program. In addition, it investigates parking characteristics and minor trouble spots within the study area defined by an External Cordon which closely follows the City boundary.

- *The various survey procedures, (Home Interview Survey, Roadside Interviews at the External Cordon, Truck/Taxi Interviews, Inventories, Traffic Counts and special surveys) are described in Chapter 2.*

****

STAGE II - GETTING THE TRANSPORTATION FACTS

Chapter 3 presents direct results of many of the surveys undertaken. These include the classification of streets by function, measurements of vehicle volumes, intersection turning movement counts, speed and delay surveys and capacity analyses.

- The present system of functional classification is questioned, and an alternate system recommended.

- *The street inventory shows that many streets have less right-of-way than the 86 - 120 feet allowances recommended in the Sudbury Official Plan, and it is recommended that street widenings be undertaken within the framework of the construction program.*

- Analysis of traffic accidents shows that the annual accident toll is rising, and that locations of high accident frequency are clustered in and around the downtown area. It is recommended that more detailed analysis of accident data be undertaken as a basis for the design of improvements and preventive measures.

- *24-hour weekday traffic volumes are presented: Kingsway, Lorne Street South, Notre Dame Avenue, Regent Street South and La Salle Boulevard are identified as the most heavily traveled streets. A continuing program of traffic counting is recommended.*

- The daily and hourly patterns of traffic are presented for various locations to show the effect of peak hourly and peak weekday flows on traffic operation.

- *Intersection turning movement counts are discussed and tabulated, and capacity problems are identified at Lorne/Elm, Durham/Elm, Lisgar/Beech/Notre Dame and Notre Dame/La Salle intersections.*

- Sudbury suffers from special problems which have developed because the railways originally made use of the natural valleys in the area. Certain major roads (e.g. Lorne Street, Frood Road) closely parallel the railway tracks.

- *There are extensive railway facilities in Sudbury, and the Main C.P.R. tracks and yards are oriented in the N.W. - S.E. direction, cutting across the heavy S.W. - N.E. axis of traffic movement. Two underpasses, one overpass and two at-grade crossings provide a total of 14 traffic lanes across the railway, and the provision of greater capacity is identified as a major requirement of the Plan.*

****

Chapter 4 includes an analysis of traffic entering and leaving the downtown area, together with the results of a survey of the supply and usage of parking facilities.

- Attention is directed to the radial pattern of Sudbury's street system which funnels large volumes of unwanted traffic through the downtown area.

- *Tabulations are presented showing the characteristics of parking in the downtown area, and it is recommended that parking conditions be kept under continuous review.*

- A comprehensive study of the core area is suggested, to determine the precise location of future parking garages.

- *The Parking Authority is complimented on its achievements to date: it is exhorted to define future policies as the foundation for a plan to meet the great challenge imposed by the substantial predicted growth in downtown floorspace.*

****

Chapter 5 presents data on the operation of the bus system in Sudbury, and on the travel characteristics of passengers.

- It is noted that a special study of transit was not required by the terms of reference, but that considerable data was compiled during other surveys (particularly the Home Interview survey) which is useful to an analysis of the transit situation.

- *The recent history of Sudbury's buses is briefly reviewed, and it is noted that franchises expired after the City annexed additional land in 1960. In 1963, four bus companies were operating in competition.*

- Bus routes covered 94% of the developed area and 97% of the resident population in 1963, but specific analyses of service quality, bus loadings and frequencies were not possible due to the overlap of competing routes and the frequent route changes.

- *Speed and delay studies indicate that buses are a slower means of travel than the private automobile, but it is emphasized that buses provide an essential service to those who do not have access to an automobile.*

- Analysis of desire lines emphasizes the importance of bus travel:

  - for adults without cars
    for schoolchildren, particularly high school students
    and for trips to and from the downtown area

- *It is estimated that elimination of bus services would create an immediate demand for two additional 4-lane roads to serve the downtown area.*

- The setting up of a Public Transportation Committee to guide, regulate and coordinate public transportation is recommended.

- *Each of the chapters in Stage II contains detailed suggestions for modifying and improving the transportation elements referred to, as well as comments on prospective future policies and programs.*

****

STAGE III - DEFINING THE PROBLEM

During the fall of 1963, when field work for this study was being carried out, many people were asked for details of their daily and occasional journeys. Some were visited in their homes, others were interviewed at work and still others were stopped and interviewed on the highway. In all cases they were asked to contribute specific information to the study, and some 99% generously cooperated. From the massive array of answers, "desire line" diagrams were compiled to show where people travel and why they make these journeys. Land use plans already define what sort of buildings or places of interest exist in each part of the City, and previous transportation studies have shown that trip patterns are directly related to these land uses.

By comparing the reported trips with the known land uses, a formula is developed for the projection of future travel. Thus, the projected growth and arrangement of the City allows estimates to be made of the 1985 traffic volumes to be accommodated on the street system. The results of this analysis are outlined in Chapter 6, and explanations of the procedures and supporting technical data are contained both in Chapter 6 and in the technical appendix.

When reviewed in reference to desirable standards of roadway geometrics and capacity, all the work to this point - counts of existing traffic volumes, accident analyses, and traffic projections - indicates the existence of deficiencies, and the location and extent of future requirements.

- The analysis shows that 124,000 trips per day occurred in the Sudbury area in 1963. Based upon the population and employment projections, some 246,000 trips per day may be expected in 1985.

  Internal trips will increase from 89,000 (1963)
  to 187,000 (1985)

  Internal-External trips will increase from 30,600 (1963)
  to 51,600 (1985)

  External-External trips will increase from 4,100 (1963)
  to 8,100 (1985)

- *The greatest increase in trips is associated with the downtown area where the volume of attracted trips (22,100 per day in 1963) will increase with projected floor space to 54,000 in 1985.*

- Within the region, the construction of a new route from Levack to Timmins will possibly have an important effect upon trip patterns, although the amount of traffic which will use this route cannot be accurately determined at this juncture.

- *In the City there will be further emphasis on traffic along the S.W. - N.E. axis, and this will result in additional problems in downtown Sudbury.*

- In the Central Business District, the heavy pressures for increased access and circulation capacity will require that non-destined trips be transferred to bypass facilities.

- *Various surveys have shown the characteristics of traffic, existing deficiencies and future needs of the street system. These must be related to the GOALS and OBJECTIVES of the City, and to DESIRABLE STANDARDS OF SERVICE, prior to the development of a transportation plan.*

- The surveys and analyses to this point have indicated major problem areas, such as:

  - Route capacity and other problems between downtown and the north-east segment of the City, with particular reference to Notre Dame Avenue and Kingsway

  - Physical intersection and alignment problems south and west of downtown, particularly at the Lorne/Regent intersection

  - Access and circulation capacity problems related to the Central Business District. Many of these arise from the radial street system and the barriers formed by the topography and the railway

  - Diverse problems of alignment, capacity etc. in various parts of the street system, which require detailed attention

****

STAGE IV - DEVELOPING THE TRANSPORTATION PLAN AND FINANCIAL PROGRAM

Chapter 7 introduces a selection of proposals which have been previously recommended by others, including:

- The Brady Street Extension to the Kingsway/ Bancroft intersection (Ref. 3T)

- The South-West Bypass (Ref. 4A)

- New Route via Fir and Louis Streets (Ref. 9B)

- New Route from Clarabelle Road to La Salle Boulevard (Ref. 11B)

- New Route via Ramsey Creek (Ref. 22C)

- New Route south-east of Ramsey Lake (Ref. 23C)

- *Evaluation of these routes indicates that they do not effectively serve the existing or projected future needs of the area. However, they may be of value as bypasses, development roads or scenic routes serving traffic other than the heavy weekday flows.*

****

Chapter 8 describes the elements of the recommended plan and contains a series of exhibits illustrating the recommendations. A map of the Recommended Major Street System (Exhibit 0.A) is contained in the pocket at the back of this report.

- The improvement and extension of Brady Street as an expressway facility is recommended, and interchanges are proposed at Regent/Lorne/Brady (Ref. 1T-1), at Brady/Drinkwater (Ref. 1T-2) and at Brady/Lloyd/Kingsway (Ref. 1T-3).

- *Widening and other improvements of major arterial streets - Lorne Street (Ref. 1A), Kingsway (Ref. 1A), Regent Street (Ref. 2A), and McLeod Street (Ref. 3A) - are recommended.*

- A number of improvements are recommended in and around the downtown area, including: the connection of Pine and Beech Streets with a new underpass at the C.P.R. (Ref. 5B); the development of a new route with a viaduct over the C.P.R. and Frood Road to connect Alder Street and Kathleen Street (Ref. 10B); the provision of a new bridge over the C.P.R. to connect Paris Street and Drinkwater Street (Ref. 4C); and the extension of Drinkwater Street northward to meet Notre Dame Avenue (Ref. 11C).

- *Route improvements are recommended in the New Sudbury and Minnow Lake areas, and a new route is proposed to connect the Notre Dame/Kathleen intersection with the Barrydowne/Gemmell intersection (Ref. 7B).*

- Recommendations are made for the provision of collector streets in various neighbourhoods and community areas.

- *All recommendations have been developed within the context of a CONCEPTUAL PLAN. The locations of individual routes have not been finally fixed, and this and other factors will receive further attention when authorization is given to proceed with the FUNCTIONAL DESIGN of specific projects.*

****

Chapter 9 discusses a series of projects which may be considered as alternatives to the Recommended Plan.

- The Brady Street Extension to the Kingsway/Falconbridge intersection (Ref. 2T-1) is reviewed and compared with proposals in the Recommended Plan. It is concluded that the Recommended Plan provides superior traffic service and capacity.

- *The possible extension of York Street north-westerly to Lorne Street (Ref. 5A) is discussed, and is found to be less desirable than the proposals involving McLeod Street.*

- Alternative alignments for the connection of Levack Road and Elm Street West (Ref. 1B) and the connection of Alder and Kathleen Streets (Ref. 10B) are discussed, and a route from Notre Dame Avenue to Barrydowne Road running north of the C.N.R. line (Ref. 8B) is examined.

****

Chapter 10 presents the Construction Staging and Financial Requirements of the Recommended Plan.

- The criteria used to establish construction priorities include such items as Existing Traffic, Future Growth of Traffic, Estimated Roadway Life, Sequence of Improvements, Coordination and Financial Capability. These are listed and explained.

- *Having arranged the projects into a series of four 5-year construction stages, cost estimates are developed for each stage*

Stage I	*$10.6 million*
Collector Streets (Stages I and II)	*$ 0.6 million*
Stage II	*$ 9.0 million*
Stage III	*$ 3.8 million*
Stage IV	*$ 4.1 million*
Total cost of recommended plan	*$28.1 million*

- It is explained that the Department of Highways will pay one third of the construction costs, and that a greater contribution may be forthcoming depending upon the negotiations and agreements reached with the Department respecting King's Highway Connecting Links.

- *Attention is directed to the fact that the cost estimates refer ONLY to major capital works, and that additional work involving reconstruction, realignment, operation and maintenance by City Departments will be necessary. This will require further funds.*

****

STAGES V and VI - ADOPTING AND CARRYING OUT THE PLAN

It is only when all the above has been completed, that the most important work - that of translating the plan into action - can be started. The citizens of Sudbury, the City Council and the Provincial Government should study the report, discuss the proposals and make any necessary adjustments. The report should then be formally adopted, and money and staff provided to implement the recommendations. The climax of the transportation planning procedure will be realized when the citizens of Sudbury and visitors to the area can enjoy safe, convenient and efficient travel throughout the City and region. Some suggestions towards the accomplishment of this end are presented in Chapter 11.

****

The above comments provide a very brief outline of the Sudbury Area Transportation Study.

The technical appendix contains much of the Survey material and factual data used during the prosecution of the Study. These provide a body of reference material and a background against which to evaluate the Recommended Plan, as well as a foundation from which to extend and update the Plan.

An illustrated Summary of the Study has also been prepared under the title "A PLAN FOR PROGRESS".

STAGE I - ORGANIZING FOR THE JOB

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1.B	*THE TOPOGRAPHY OF SUDBURY*	*following Page 4*
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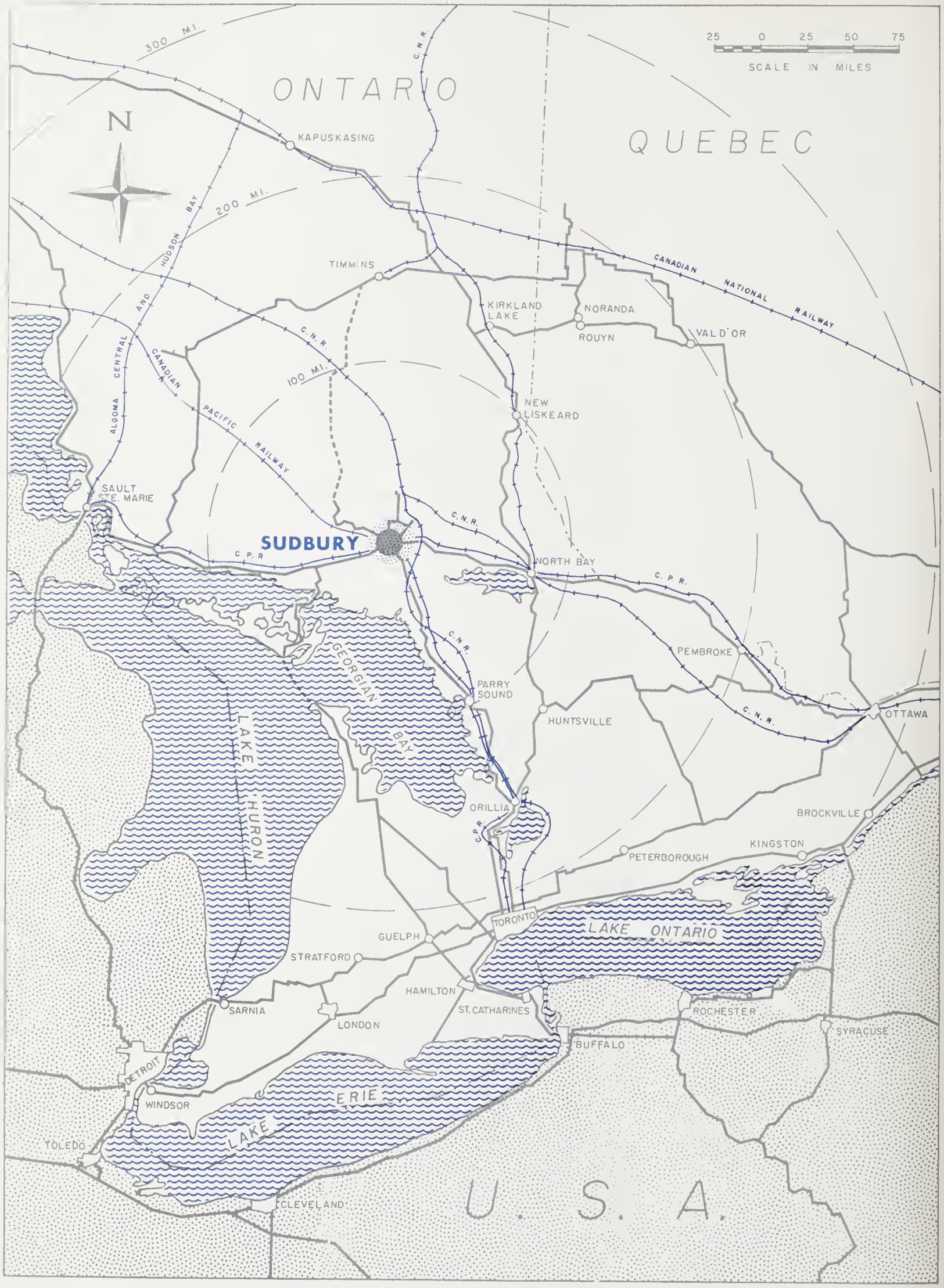


LOCATION

OF THE

CITY OF SUDBURY

EXHIBIT 1·A

CHAPTER 1

INTRODUCTION TO SUDBURY

1.1 LOCATION OF SUDBURY

Sudbury is located about 40 miles north of the shore of Georgian Bay. It is some 250 miles northwest of Toronto, approximately 300 miles west of Ottawa, and is the major population centre and regional focus for an extensive area of Northern Ontario as shown in Exhibit 1.A. Sudbury is a strategic meeting point of road and rail routes; Highway No. 69 (the Georgian Bay Route of the Trans-Canada Highway) meets Highway No. 17 (the Lake Superior Route) at Sudbury; and C.P.R. trans-continental trains from Vancouver divide at Sudbury before proceeding on to Toronto and Montreal.

Sudbury is built upon the rugged terrain of the Canadian Shield, amid the hard igneous rock and forest areas which cover much of Northern Ontario and Northern Canada.

1.2 HISTORICAL BACKGROUND OF SUDBURY

Sudbury has grown at an enormous rate since the coming of the railway in the 1880's. In 1900 the population was about 2,000; by 1963 this had grown to more than 80,000, with a further 30,000 people living in the surrounding region which is generally dependent upon the City for major services.

It is said that Sudbury was founded on its present site as the result of a surveyor's error; indeed, many wish that it had been established a few miles distant, in one of the areas which are topographically less tortuous. However, when the C.P.R. was constructed on the north shore of Ramsey Lake, a camp was set up for the railway construction crew and this was the nucleus around which Sudbury grew.

The railway construction disclosed the mineral potential of the area and mining began to develop. In 1887, the C.P.R. laid out a town site, and the town grew rapidly to become incorporated as a city in 1930. During and after the 1939-45 World War, the demand for Sudbury's products, particularly nickel, increased and "The Nickel Capital of the World" continued to experience considerable growth both within the corporate boundaries and in surrounding areas. The present boundaries of the City of Sudbury were established in 1960 when much of the adjacent suburban development was annexed to the former city.

Although the importance of the railway to the economic life of Sudbury has tended to decline through the years, mining in the area has grown from strength to strength, showing spectacular advances during and after the Second World War.

While the prosperity of Sudbury is founded upon the area's mineral resources, most of the mining and the associated smelting and refining processes are carried on outside the limits of the City proper, at Copper Cliff, Coniston, Garson, Falconbridge, Levack etc. The mines inside the City boundaries, (Murray, McKim, Frood and Stobie) account for only a minor portion of the total industrial activity and employment in the area. Sudbury provides homes for many of those working in the mines and processing plants in and around the City, and is the regional shopping and service centre for a large geographical area.

1.3 TOPOGRAPHY AND LAND USE

Exhibit 1.B indicates the physical form of the land within the City boundaries. The comparison of the street plan with the contours indicates how streets of a rectangular grid pattern have been combined with routes following natural features to create a unique pattern of urban development.

The present downtown area, which has developed from the early settlement, lies in a basin north of the C.P.R. facilities: it is bounded on the south and west by the railway properties and by substantial rock outcrops to the north and east. Development grew out from the downtown area as natural features and municipal limits permitted. The best routes had generally been occupied by the C.P.R. before urbanization spread, and main roads often tended to follow the same favourable routes chosen by the railway: Lorne Street, for example, runs immediately alongside the railway right-of-way. Only New Sudbury, north-east of the former City, has developed away from the old city centre on gently undulating land.

Industry has developed close to the extensive railway facilities, and except for two recent shopping centres, the commercial development of the area has been very much concentrated on the downtown section of the City. These features, together with other important land uses, are shown in Exhibit 1.C. In studying this or any other plan of Sudbury, constant reference should be made to the topography and contours because where there may appear to be vacant areas in the development pattern, a second look will generally show that a rock outcrop, a steep rock face or other natural feature is associated with every interruption or gap in the urban fabric.

1.4 THE FUTURE OF SUDBURY

Projections for the future of Sudbury are based upon the expectation of a continuing firm market for the mineral resources which form the primary output of the area, and upon a consolidation of the City's role as shopkeeper and service centre for the population of an extensive region.

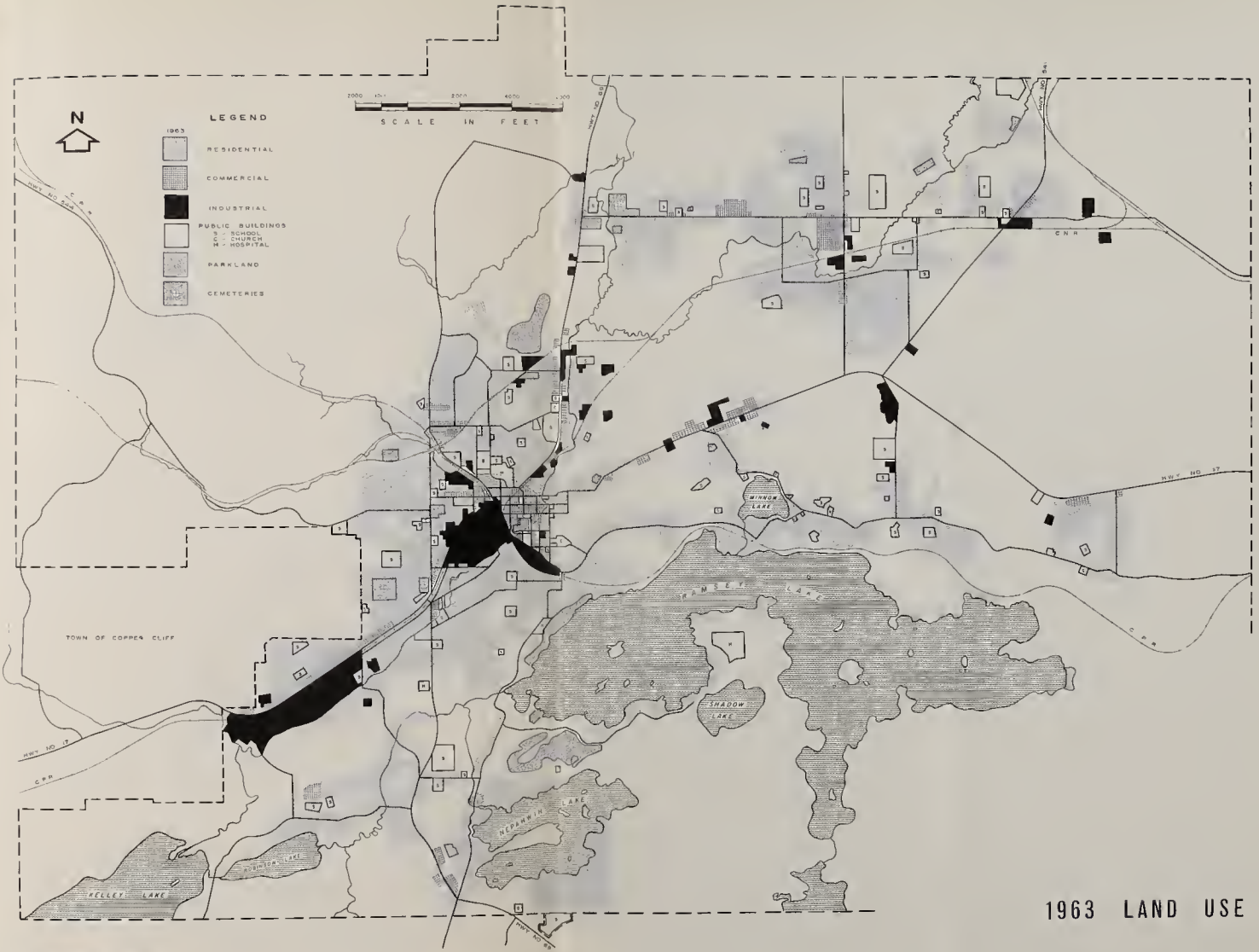
THE TOPOGRAPHY OF SUDBURY

SCALE IN FEET

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT 1-8



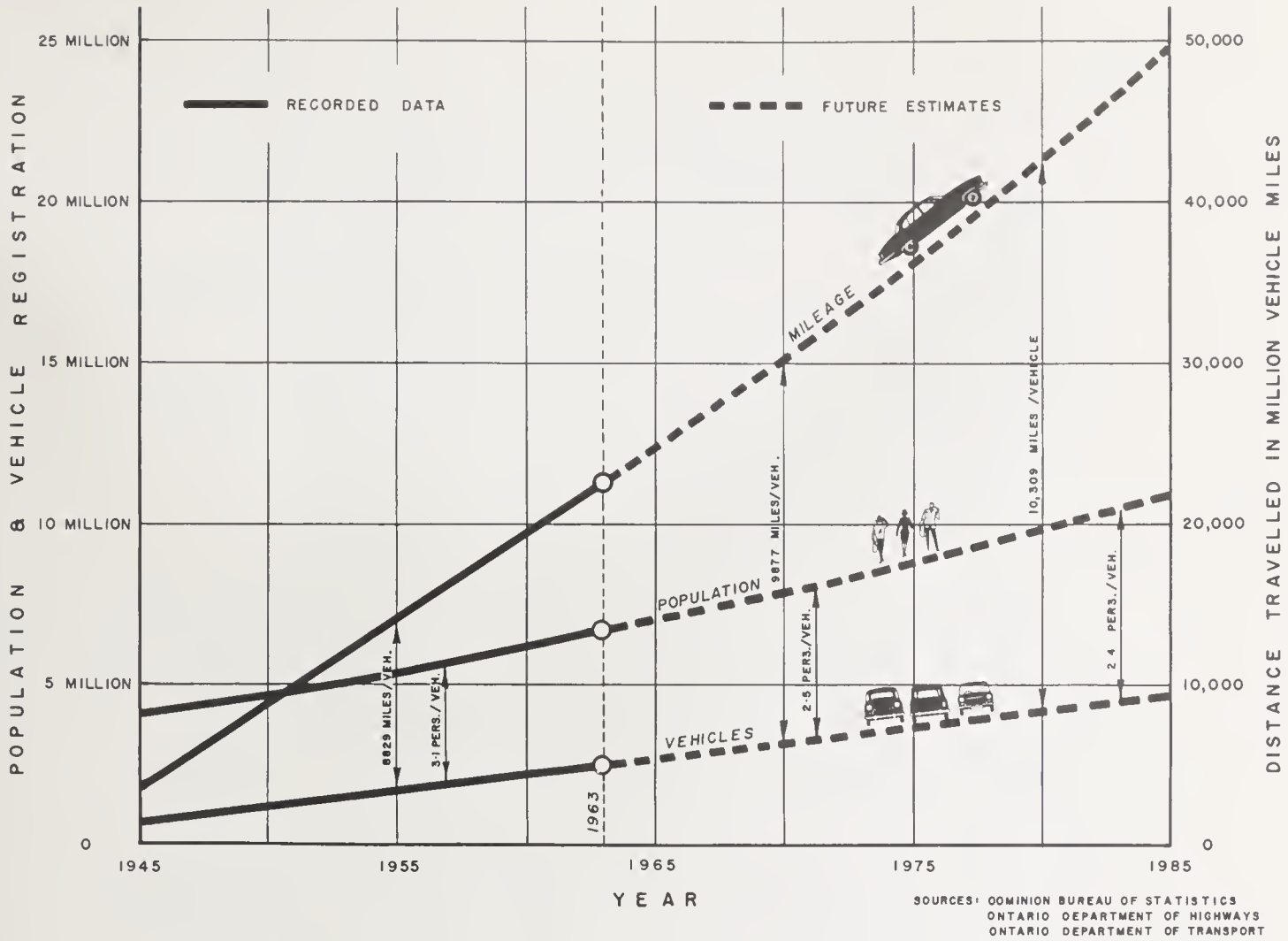
1963 LAND USE

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

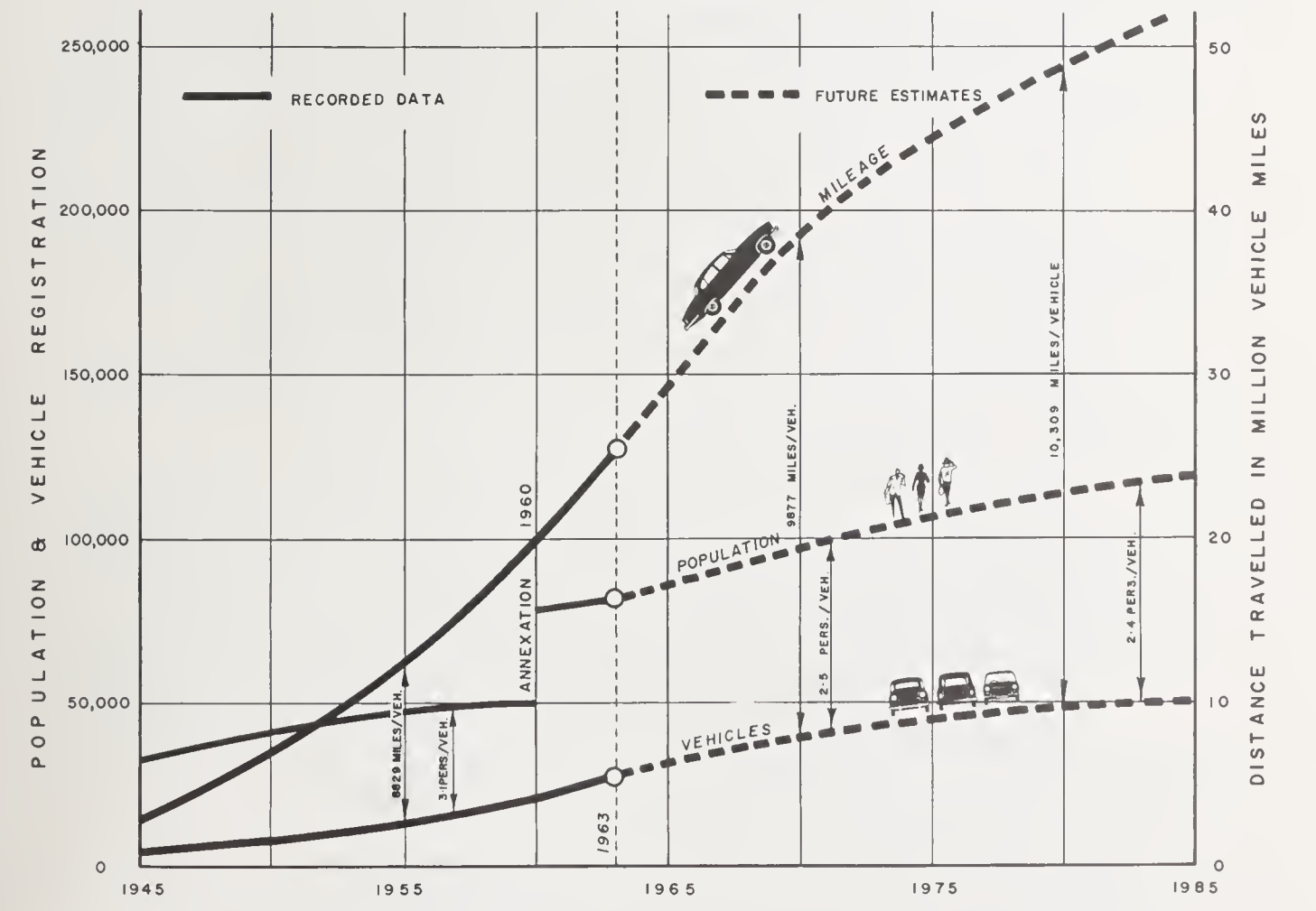
EXHIBIT 1-C

ONTARIO



SOURCES: DOMINION BUREAU OF STATISTICS
ONTARIO DEPARTMENT OF HIGHWAYS
ONTARIO DEPARTMENT OF TRANSPORT

SUDBURY



SOURCES: DOMINION BUREAU OF STATISTICS
SUDBURY PLANNING BOARD
ONTARIO DEPARTMENT OF TRANSPORT

TRENDS IN POPULATION VEHICLE REGISTRATION and ANNUAL MILEAGE

It will be apparent from the preceding description that Sudbury must contend with several disadvantages during the course of its future development. These mostly arise from the difficult terrain which makes all forms of construction specialized and expensive. At the same time, Sudbury enjoys no broad base of industrial assessment within its boundaries, to contribute tax revenues toward development costs (a per capita grant for resident miners helps to offset the latter's effect.)

1.5 PROJECTIONS OF POPULATION AND TRAFFIC

Exhibit 1.D shows the changes in population since 1945 and the anticipated growth of population in the City of Sudbury and in the Province of Ontario. The population growth of Sudbury will tend to impose further strain and congestion upon the network of travel facilities. Of equal concern, however, is the fact that the number of vehicles in all parts of the Province is growing at a faster rate than the population itself. It is confidently predicted by several authorities that the ratio of one automobile for every 2.4 persons will be reached by 1980. Not only is the number of automobiles increasing, but the trend of our society to automation creates more leisure time and leads to greater mobility, which in turn result in an annual increase in the number of miles travelled per vehicle. In 1955, the average annual mileage was about 8,829 miles per vehicle: this will probably increase to 10,309 by 1980*. The cumulative effect of these three factors will produce a stern challenge for the planners and designers of a transportation system to serve needs 5, 10 and 20 years hence. Because facilities must be designed and constructed to serve a useful life of 25 to 30 years, their future roles and functions must be determined now, so that the effort and expense involved will be utilized as fully and effectively as possible.

It was with these prospects in mind, that the City of Sudbury set up a Technical Coordinating Committee to prepare Terms of Reference for the Sudbury Area Transportation Study. In early 1963 M. M. Dillon Limited was retained to prepare a Study Appraisal. This detailed the methods, procedures and estimated costs of surveys and analyses, including the preparation of a Transportation Plan and Program. City Council subsequently authorized this firm to proceed with the Study and prepare a report.

* See Historic Trend and Forecast of Motor Vehicle Travel in the Province of Ontario by Department of Highways, Ontario 1960.

CHAPTER 2

OUTLINE OF THE TRANSPORTATION STUDY

2.1 THE UNIVERSAL TRAFFIC PROBLEM

> "The daily movement of people and goods in urban areas has become one of the most complex and difficult problems facing public officials today. Only decisive action can stem the rising tide of traffic congestion, confusion and accidents threatening the social and economic health of our communities".

So begins the introduction to the book "Better Transportion for Your City", a guide to the factual development of Urban Transportation Plans prepared by the U.S. National Committee on Urban Transportation. In the execution of the Sudbury Area Transportation Study, the Consultants have generally followed the procedures recommended by this Committee, as well as those of the Ontario Department of Highways, the U.S. Bureau of Public Roads and others active in this major field of endeavour. In particular, much recourse has been made to the series of Procedure Manuals prepared by the National Committee on Urban Transportation, for various study techniques. Furthermore, this report is closely aligned with the "Recommended Stages for Establishing a Transportation Planning Program", as described in the book "Better Transportation for Your City" and shown in Exhibit 2.A.

2.2 SCOPE AND OBJECTIVES OF THE STUDY

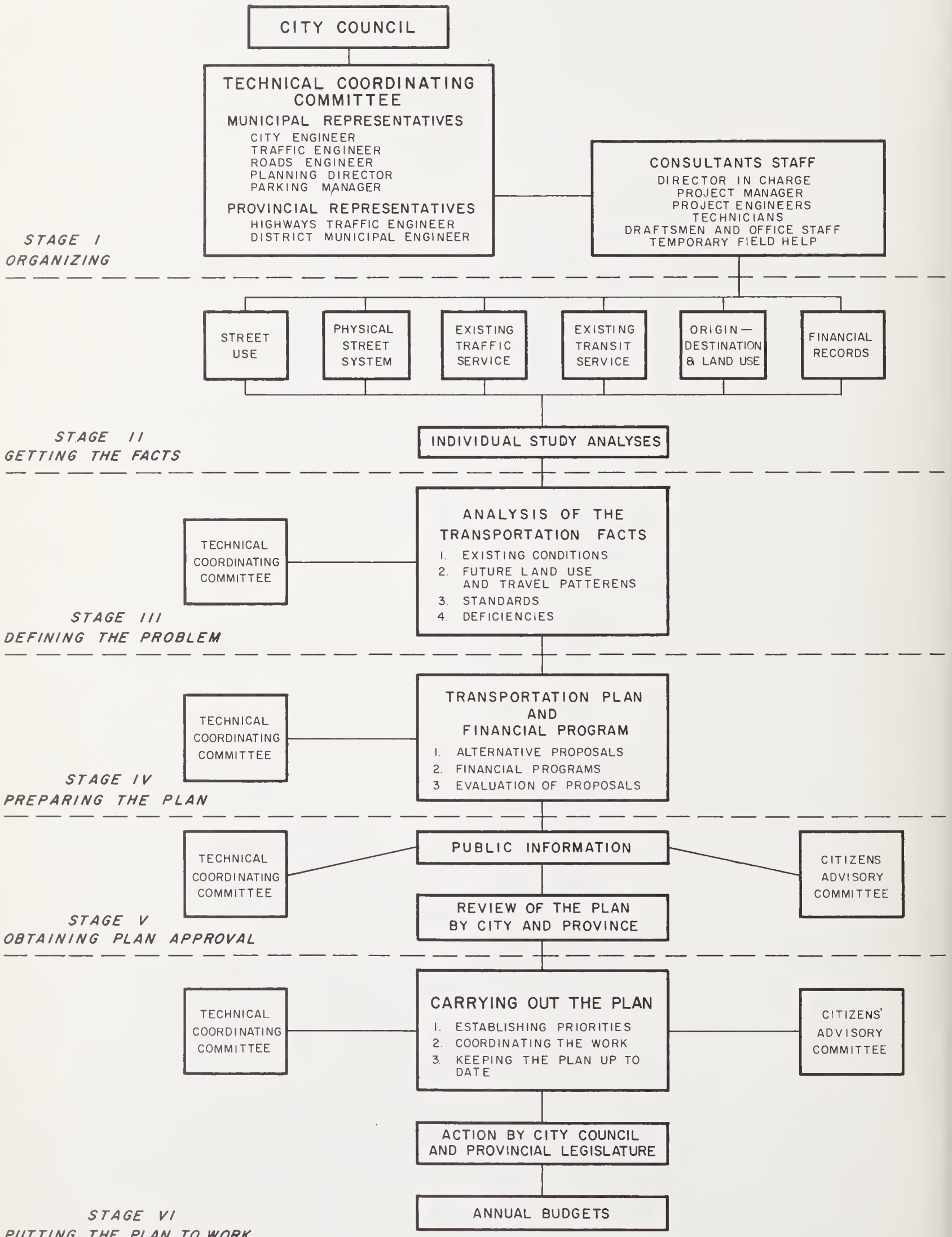
The specific objectives of the study, as designated in the Terms of Reference and Study Appraisal, are as follows:

1. The formulation of a major road and street plan designed to complement future land use, and to further encourage sound economic growth wherever possible.

2. The presentation of a construction program designating improvements to be made in five-year stages, based upon the priorities and needs demonstrated by the Study investigations and projections.

3. The investigation of current parking characteristics to secure basic data essential to an understanding of parker desires. This shall include such items as curb and offstreet parking practices as related to duration, turnover, illegal usage and enforcement. These fundamental data will strengthen the basis of a sound parking program. Areas of extensive deficiency will be delineated, where the comprehensive parking study approach may be economically applied prior to the construction of high unit-cost parking facilities.

ESTABLISHING A TRANSPORTATION PLANNING PROGRAM



ADAPTED FROM Fig. 1 Page 5
"BETTER TRANSPORTATION for YOUR CITY"

EXHIBIT 2·A

4. The investigation of the present King's Highway Connecting Links and their evaluation in terms of local and through traffic service for both present and future traffic demands and capacity.

5. The investigation of existing traffic trouble spots, and recommendations for overcoming local deficiencies.

Item 4 was deleted from the specific requirements of the Study in January 1965. The Technical Committee requested that, following presentation of the final report, the consultant prepare a brief containing recommendations for connecting links.

2.3 THE STUDY AREA

The boundaries of the study area, as defined by the Technical Coordinating Committee, correspond very closely with the boundaries of the City of Sudbury (as revised in 1960). External Cordon stations were located as close as possible to the City boundaries, bearing in mind the relatively straight alignments and generous sight distances required for safe and efficient roadside interviewing.

The study area was subdivided into origin and destination zones for the analysis of trip data. This was done mostly by referring to the existing and future land use patterns developed by the Planning Board, and presented in the Sudbury Official Plan Amendment No. 1 (1961). The basic arrangement of origin and destination zones closely follows the layout of residential neighbourhoods as designated by the Planning Board, while concentrations of commercial and industrial land use are segregated within separate O. and D. zones wherever possible.

The study area boundary and the O-D zones are indicated on the Street Map (Exhibit O-O) which may be found in the pocket inside the back cover.

2.4 SURVEY PROCEDURES

2.4.1 Home Interview Survey

This was undertaken by Gruneau Research Limited, a firm specializing in Market Research. A staff of lady interviewers was hired in Sudbury for the duration of the survey (approximately 10 weeks): staff training and supervision were carried out by the full-time personnel of Gruneau Research Limited.

Random sampling techniques were applied to the assessment rolls, in order to select every eighth dwelling unit in the City of Sudbury. Interviewers were assigned to visit each sample unit, and obtain all travel data pertinent to the Study from occupants over the age of five years. Examples of the interview forms used are included in the Appendix to this report. (Exhibit A.A).

A series of checks and controls was instituted to verify the reliability of the sampling procedure, and the completeness and accuracy of interviews obtained. A special complementary study covering

institutional establishments (e.g. the sanitorium, the convent etc.) and residential hotels was carried out in an effort to obtain complete data on all the person-trips taking place in the area during a 24-hour period.

The information obtained from the home interviews was used to project future traffic volumes as described in Chapter 6.

2.4.2 Roadside Interviews at the External Cordon

This work was carried out for the Ontario Department of Highways, using the staff hired by M. M. Dillon Limited in Sudbury.

There were 13 stations on the External Cordon, as shown on the Exhibit O-O. The eight stations having the heaviest volumes accounted for more than 96% of the total traffic crossing the cordon. At each of these eight stations, inbound traffic was interviewed on a weekday from 7:00 a.m. to 7:00 p.m. The overall sample represented some 95% of the one-way traffic passing through the stations during the 12-hour survey period. Of the 14,650 interviews collected, 99% were cordeable, and hence usable for data analysis. The interview forms used for this survey are included in the Appendix to this report. (Exhibit A.C).

2.4.3 Truck/Taxi Interviews

From the 1962 vehicle listings of commercial vehicles in Sudbury, every fifth vehicle was selected for interview purposes. After contacting each owner by mail to inform him of the survey, an interviewer went to his place of work, or to his home, and obtained data on all trips made by the selected vehicle during 24 hours of a selected weekday.

A listing of taxi permits in the City of Sudbury was obtained from the Sudbury Police Department, and the taxi companies were contacted by mail to advise them of the survey. Subsequently, every taxi driver in the Sudbury area was supplied with trip report forms to be completed for a 24-hour (weekday) period.

370 commercial vehicles and 96 taxis were contacted in this way, and these yielded 2.705 and 2,308 usable trip reports respectively. The trip report forms used in this phase of work are included in the Appendix to this report. (Exhibit A.B)

2.4.4 Automatic Traffic Recorder (A.T.R.) Counts

Apart from the A.T.R. counts taken in conjunction with the External Cordon Survey, six automatic traffic recorder counts were taken for a minimum of seven days at control stations surrounding the centre of Sudbury, and at screen line counting stations on routes crossing the main C.P.R. line. In addition, 62 automatic traffic counts were taken for a minimum of 24 hours at various locations throughout the study area. All such counts were taken with automatic recording equipment which registered the traffic volumes quarter-hourly throughout the day, and all counts were transcribed on an hour-by-hour basis. The average daily volumes are discussed in Section 3.4 and are shown in Exhibit 3.D

2.4.5 Vehicle Classification Counts

Manual classification counts were carried out at all screen line stations for a 16-hour period (7:00 a.m. to 11:00 p.m.) on a typical weekday.

In order to increase the usefulness of the Parking Survey and to evaluate Downtown traffic movement, a Downtown Cordon was drawn around the 22 O-D zones comprising the Sudbury Central Business District and manual classification counts were carried out at all important crossings of the Downtown Cordon for a 10 hour period (8:00 a.m. to 6:00 p.m.) on a typical weekday.

These counts indicated vehicle type and number of passengers by direction of travel. The analysis of these data is contained in Chapters 3 and 4 of this report.

2.4.6 Intersection Turning Movement Counts

Manual turning movement counts were carried out at 82 intersections throughout the study area between 4:00 p.m. and 6:00 p.m. on typical weekdays. All approach volumes and turning movements were tabulated. In addition, counts were taken at five intersections serving the New Sudbury Shopping Centre from 7:30 p.m. to 9:30 p.m. on a Friday "late shopping" night. The turning movement data is tabulated in Exhibit A.G.

2.4.7 Intersection Inventory

At every intersection where turning movement counts were undertaken, pavement and sidewalk widths, corner radii, building setbacks and signing details of all the approach roadways were measured and recorded for use in the intersection capacity analyses and phtographs were taken from each approach to record the driver's view of the intersection. These data were used for the calculation of intersection capacities discussed in Section 3.7.

2.4.8 Speed and Delay Survey

Speed and delay runs were carried out on all arterial and collector routes in the study area during evening peak periods; when dictated by route function or other conditions, certain runs were repeated during the morning peak period and on "late shopping" nights. In each case, at least three runs in each direction were made, and average running speeds over predesignated control sections were calculated. This study was carried out by a single driver using route map, stop watch and tape recorder. The results of this work are tabulated in Exhibit A.H and are discussed and analyzed in Section 3.6 and Exhibit 3.F.

2.4.9 Parking Surveys

The first phase of the parking study involved the compilation of a detailed inventory of all parking spaces in the 22 zone downtown area bounded by the Downtown Cordon. This data is shown in Exhibit 4.D.

From the inventory a series of surveillance routes were drawn up and all spaces on a given route were checked at 15-minute intervals from 10:00 a.m. to 6:00 p.m. on a typical weekday. On each tour of the route, vehicle licence numbers were recorded and compared with previous tours to determine the parking duration of each vehicle.

While the parking route surveillance was being carried out, vehicles entering and leaving the downtown area were counted by direction and classified by type and number of passengers, on all important crossings of the Downtown Cordon as referred to in paragraph 2.4.5.

These three operations, when analyzed together, yielded the basic parking data which are presented and discussed in Chapter 4.

2.4.10 Transit Loading and Speed Survey

Both at peak and off-peak travel times, men were assigned to travel aboard buses on the regularly scheduled services and to count the number of passengers on the bus at selected control points along the route, while recording the time taken by the bus to travel between one control point and the next. The data yielded by this survey are presented and discussed in Chapter 5.

2.5 REFERENCE MATERIAL

Reference has been made throughout this study to all available material which seemed pertinent. Particular use has been made of the following:

(a) Major Thoroughfare Studies and Plan in the City of Sudbury and Area (1960) prepared by The Sudbury Area Planning Committee.

(b) Amendment No. 1 to the Official Plan for the City of Sudbury Planning Area (1961) prepared by the Sudbury Planning Board.

(c) Highway 17 Connecting Link. Report on Investigations, (December 1959) by Lewis Lane and Company Limited and De Leuw, Cather & Company of Canada Limited, Consulting Engineers.

(d) The Sudbury Area, Factors of the Regional Environment, by the Community Planning Branch of the Ontario Department of Municipal Affairs (March 1960; reissued - September 1960).

(e) A Study for Urban Renewal at Sudbury, Ontario (1963) prepared for the City Council by the Sudbury Planning Board and Project Planning Associates, Limited, published by the Corporation of the City of Sudbury, Ontario.

(f) Transportation Study, Street Inventory (1963) prepared by the City Traffic Engineer.

(g) Accident data compiled by the Sudbury Police Department, for the years 1961, 1962 and 1963.

(h) Traffic count data compiled by the City Engineering Department, for the years 1962 and 1963.

STAGE II - GETTING THE TRANSPORTATION FACTS

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CHAPTER 3

CHARACTERISTICS OF EXISTING STREETS AND TRAFFIC

3.1 FUNCTIONAL CLASSIFICATION OF STREETS

The City has previously used the following system of classification for major streets:

T - Throughways
A - Major Highway Connections
B - Minor Highway Connections
C - Arterial Routes
D - Collector Streets
E - Local Streets

This system has been in use by the City Engineering Department and the Sudbury Planning Board for some years, together with a sequential route numbering system for each class of street. The street classification and the street inventory data supplied to the Transportation Study by the Technical Co-ordinating Committee was based on this system,and its use has been continued in parts of this report for the systematic listing of routes.

Whilst working with the City's street classification, two deficiencies became evident:

- It is virtually impossible to define the FUNCTIONAL differences between the arterial routes in classes A, B and C.
- The re-classification of a route interferes with the established sequential numbering system.

This study therefore recommends that the City re-appraise its street classification system with a view to its re-organization with more precise definition of the functional requirements of each class of street and a more flexible route numbering system.

Adequate organization of streets into a hierarchy of functional importance is a most useful tool. It provides a guide to the geometric standards required, and to the priorities attributable to construction projects on various facilities.

There are several recommended systems of functional street classification which might be adapted to suit Sudbury's particular needs:

- The (U.S.) National Committee for Urban Transportation (N.C.U.T.) has made a series of recommendations. These are contained in "Procedure Manual 7.A - Standards for Street Facilities and Services" and summarized in Table 2, page 11 of that booklet.
- The Canadian Good Roads Association (C.G.R.A.) published recommendations on the subject in 1963.
- The City Engineers Association has drafted recommendations which have not yet been formally published.

- The Municipality of Metropolitan Toronto has developed certain basic criteria for use in connection with its own particular jurisdictional requirements.

Each of these sources can contribute some valuable points towards the improvement of Sudbury's street classification system.

The street classification criteria recommended by N.C.U.T. (which are substantially similar to those of C.G.R.A.) have been adapted and used in Exhibits 3.A and 10.A of this report. Five classes of street have been selected as follows:

Expressways and Freeways
Major Highway Connections
Other Arterial Streets
Collector Streets
Local Streets

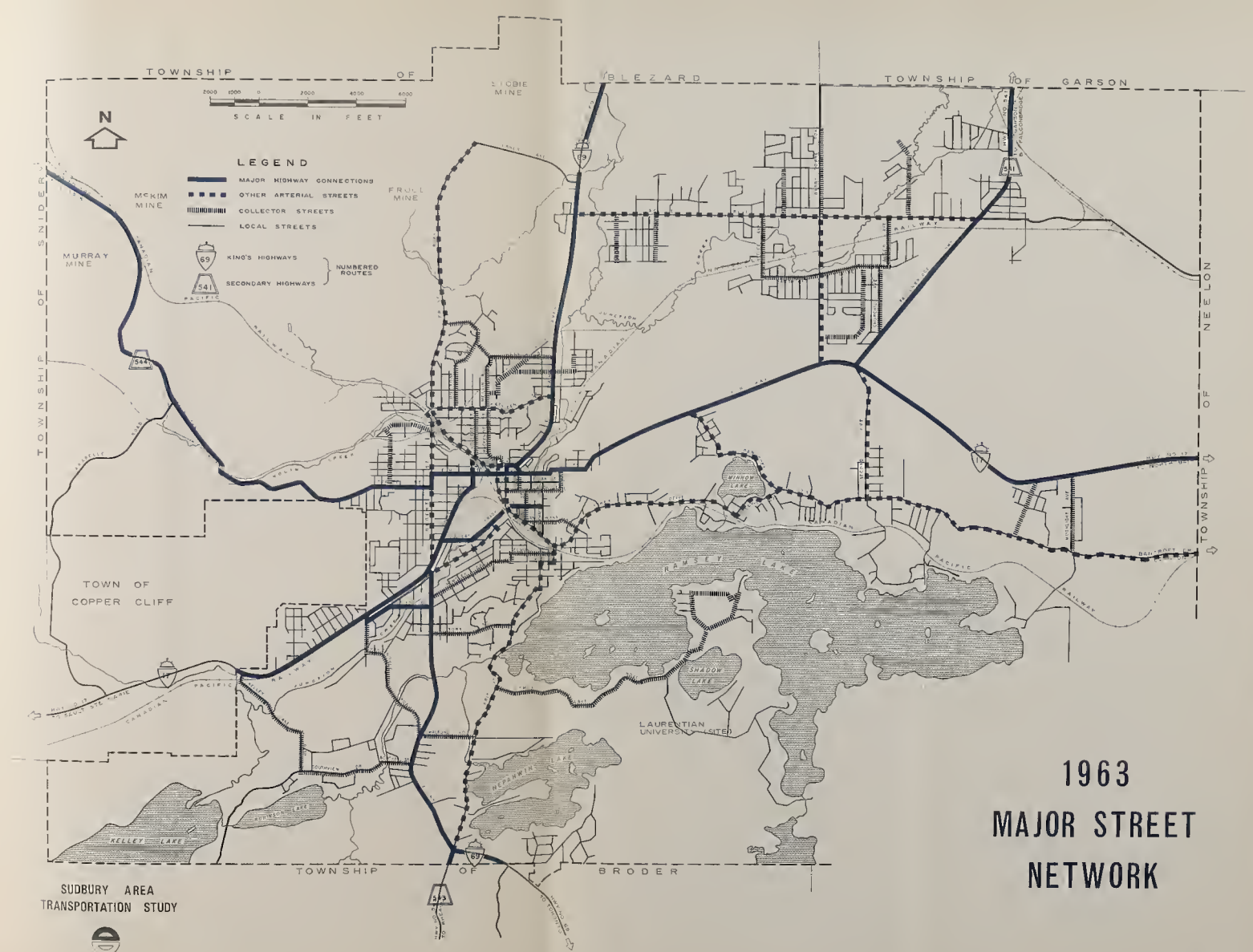
The only roadway which currently approaches the geometric requirements of an expressway is that section of Brady Street which underpasses the C.P.R. tracks. Because of the present limited length of this section, the propriety of an expressway classification is rather academic.

The important factor in defining arterial streets is the relative length of the trips they serve. It is also significant to ensure that any arterial street is connected to an arterial or an expressway at either end.

Collector streets should join an arterial or another collector at each end. The description of collector streets in Sudbury is a most difficult task; not only are many of the original neighbourhoods laid out on a grid pattern, which gives equal importance to all streets, but many minor streets have been laid out without any reference to contours or topography. This latter factor results in many discontinuities in neighbourhood street patterns, inhibiting the proper designation of and distinction between local and collector streets.

It will be seen in Exhibit 3.A, that many of the most important streets in the City of Sudbury are radial with respect to the downtown area. The principal radial routes include King's Highway No. 17 East and West, King's Highway No. 69 North, Secondary Highway No. 544, Frood Road, Paris Street and Bancroft Drive. Some other major routes are a little offset from this radial system; for example, King's Highway No. 69 South to Parry Sound and Southern Ontario, and Secondary Highway No. 541 to Garson and Falconbridge. Very few roadways provide circumferential service within the system.

Several important proposals by the Planning Board and other agencies are directed towards greater interconnection of the radial routes by the provision of bypass routes, ring roads and individual connections, but this report questions the real need for some of the suggested perimeter projects, in the light of anticipated 1985 traffic requirements revealed by the Transportation Study.



1963 MAJOR STREET NETWORK

EXHIBIT 3-A

3.2 INVENTORY OF THE STREET SYSTEM

In order to provide basic background data for the Transportation Study, the City Engineering Department compiled an inventory of the street system in 1963. This inventory brought together such information as pavement width, right-of-way widths, details of curbs, shoulders, sidewalks, drainage, etc., and estimates of expected structural life. The inventory has been used throughout this study as a basic source of information and has been constantly referred to during the development of proposals. It is a most vital source of reference-material and should be kept up-to-date within the normal operations of the Engineering Department.

Two main conclusions can be drawn from the information presented in the inventory:

- Most streets, including many of the major arterials, have right-of-way widths of only 66 feet. Where wider rights-of-way are available they are often in intermediate areas, at some distance from downtown Sudbury.

- Most streets have a short structural life expectancy, and will require major reconstruction or other improvement before 1970.

The Major Throughfares Plan adopted by the Sudbury Planning Board recommends right-of-way widths from 86 to 120 feet or greater, and the City of Sudbury Roadway Standards (Exhibit A.J) include suggested right-of-way widths which are in accordance with Planning Board recommendations. Every effort should be made to bring all rights-of-way to the agreed standards, and property acquisition for widening should reflect the ultimate street classification.

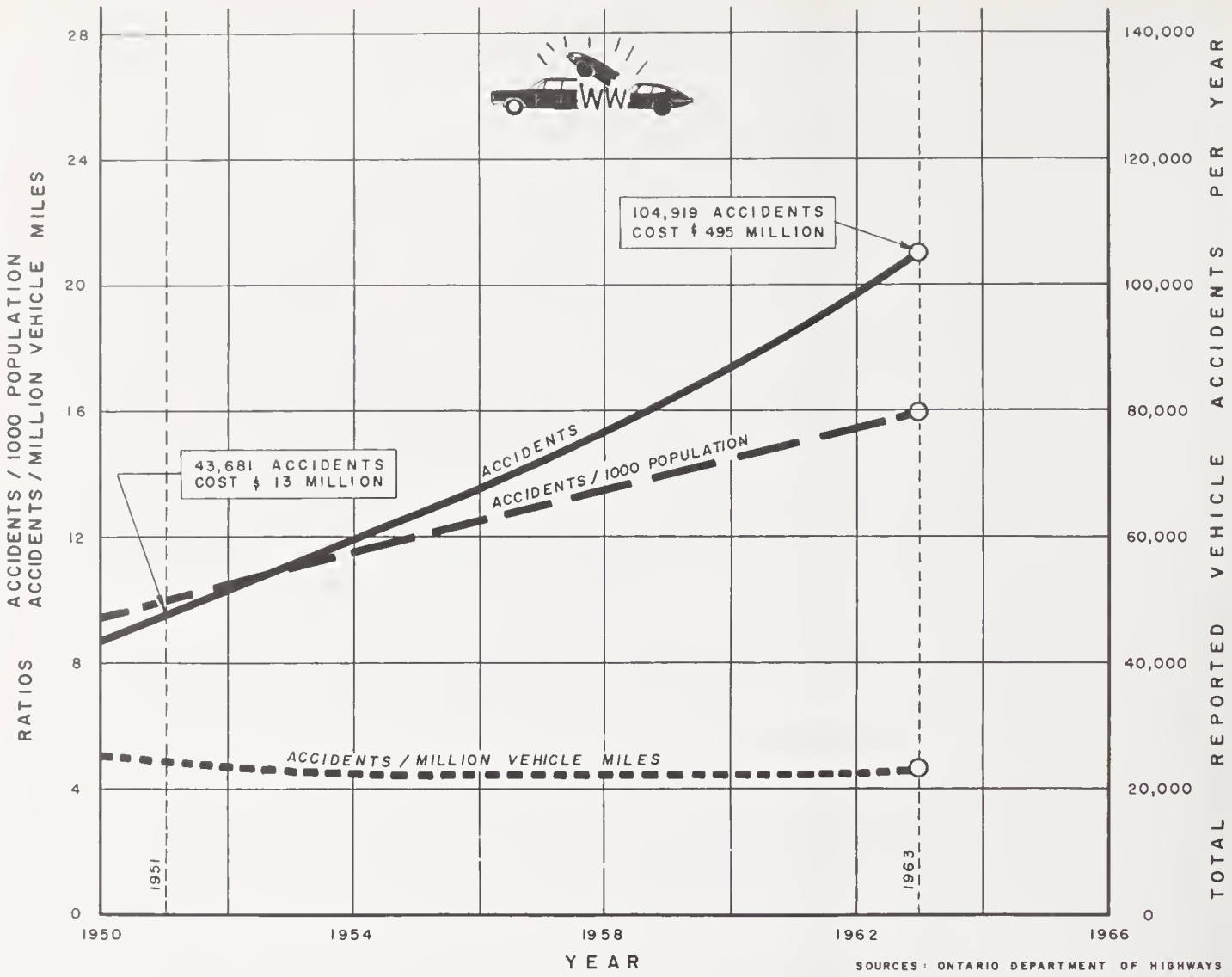
The construction program recommended later in this report has been developed primarily from the requirements of 1985 traffic demand. This program may, of course, be amended where up-to-date inventory data shows that a structurally deficient roadway requires earlier reconstruction; or conversely, a project may be postponed, where the needs of the system and adequate prospective roadway life make this feasible.

3.3 ANALYSIS OF TRAFFIC ACCIDENTS

Exhibit 3.B indicates the recent trend of vehicle accidents in Sudbury and in the Province of Ontario. In common with other urban areas, the number of accidents in Sudbury has shown a steady rise. While the valiant efforts of all those concerned with road safety have succeeded in curbing or checking this rise from time to time, the general trends of increasing vehicle ownership and vehicle mileage repeatedly offset any improvements in safety measures.

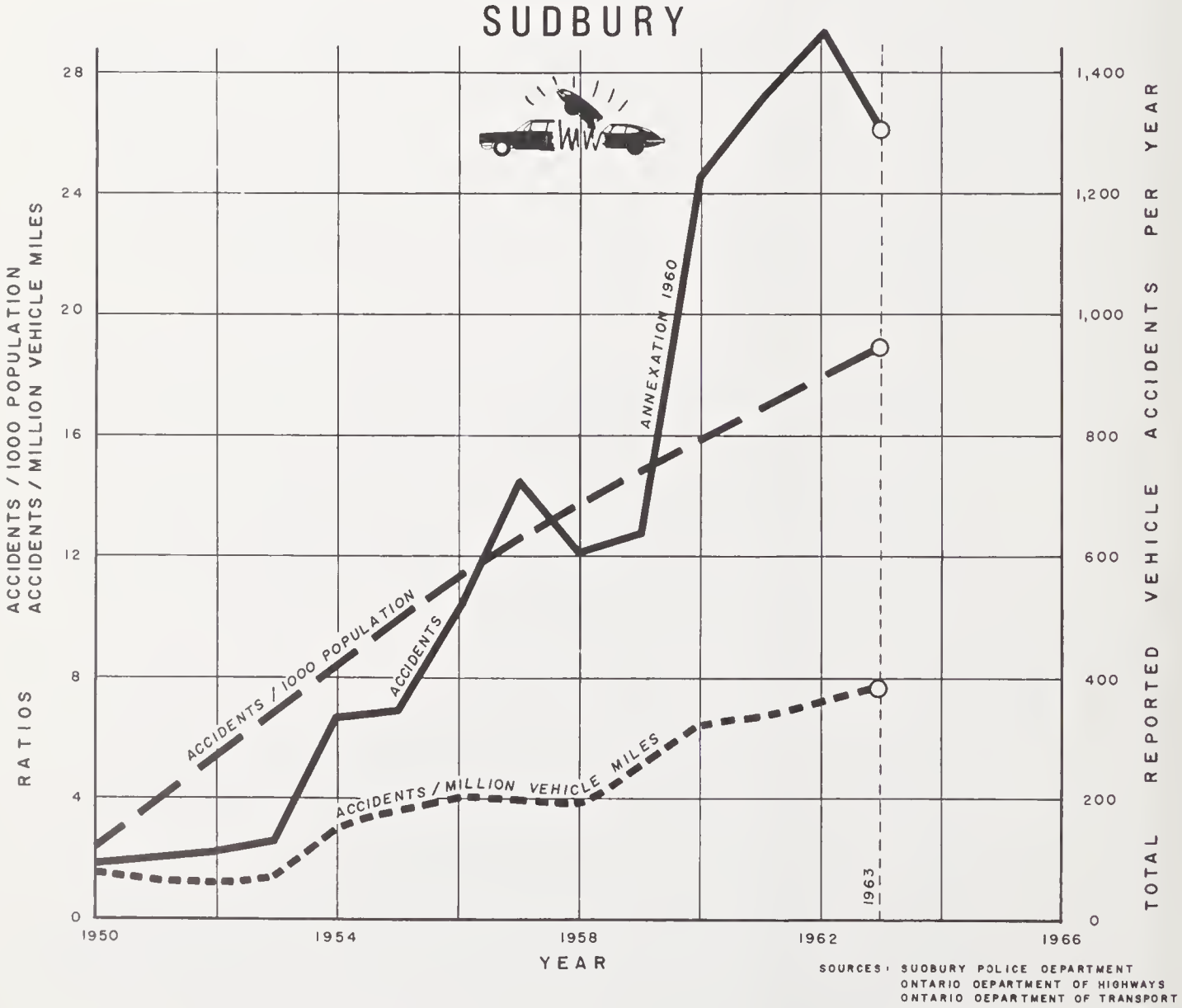
The annual reported accident figures shown in Exhibit 3.B are taken from statistics prepared by the Ontario Department of Transport, and refer to accidents involving damage greater than $100 or personal injury. As a basis for comparison, the accident

ONTARIO



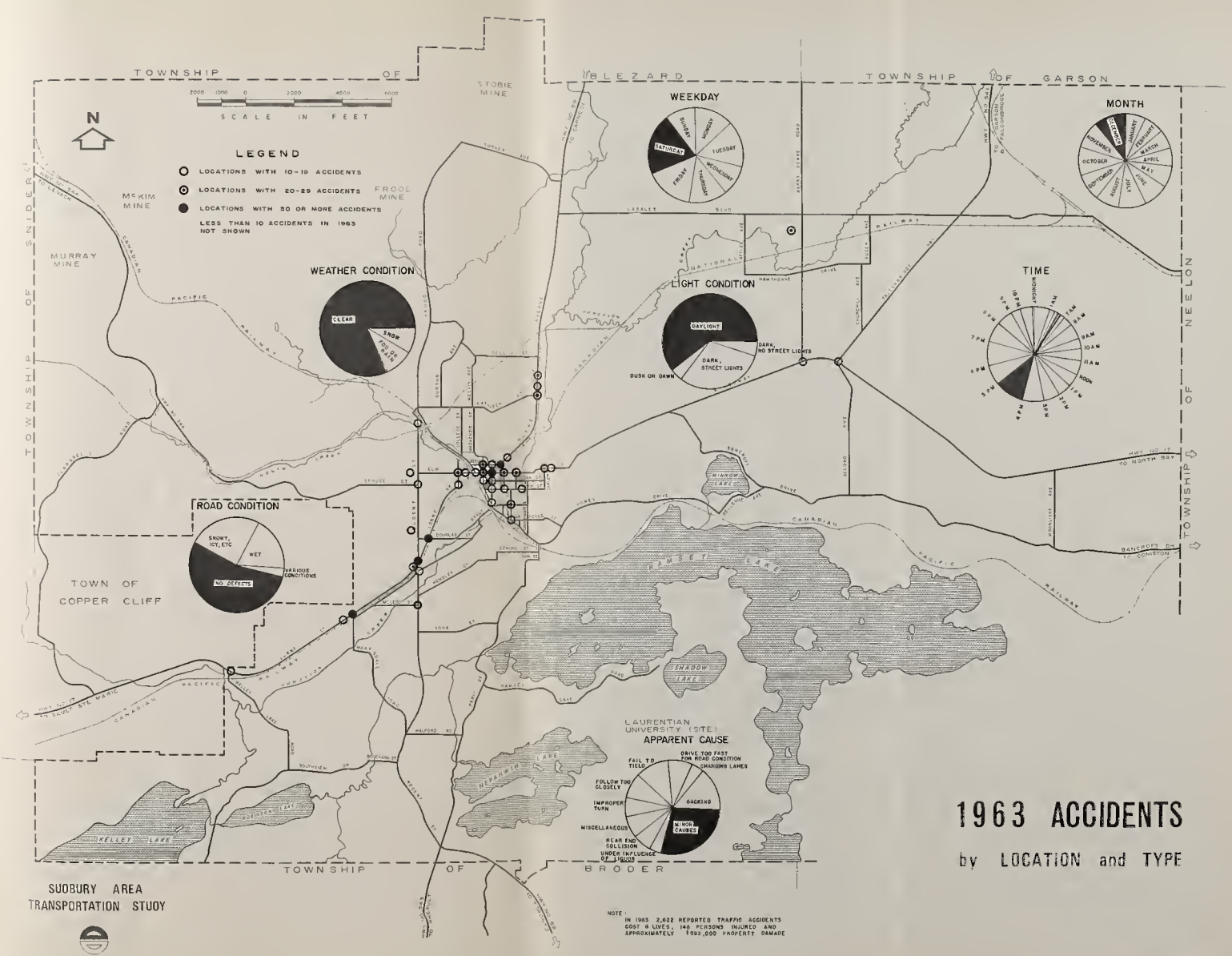
SOURCES: ONTARIO DEPARTMENT OF HIGHWAYS
ONTARIO DEPARTMENT OF TRANSPORT

SUDBURY



SOURCES: SUDBURY POLICE DEPARTMENT
ONTARIO DEPARTMENT OF HIGHWAYS
ONTARIO DEPARTMENT OF TRANSPORT

VEHICLE ACCIDENT TRENDS



1963 ACCIDENTS

by LOCATION and TYPE

SUDBURY AREA TRANSPORTATION STUDY

DILLON

NOTE:
IN 1963 2,622 REPORTED TRAFFIC ACCIDENTS COST 9 LIVES, 148 PERSONS INJURED AND APPROXIMATELY $592,000 PROPERTY DAMAGE

EXHIBIT 3-C

DIL

figures have been related to the population and annual vehicle mileages from Exhibit 1.D. The ratios show an increase in accident frequency per 1,000 persons, which beside the increase in actual accident numbers becomes a further cause for concern. In the Province of Ontario, there is a slight tendency for the accidents per million vehicle miles to decline: this may be attributable to increased construction of freeways and improved design standards on arterial streets. No similar declining trend is evident in Sudbury, however.

Some of the improvement projects recommended later in this report will help to combat the rising toll of accidents. A valuable means of retarding the mounting number and cost of accidents is the separation of conflicting movements by the provision of underpasses and overpasses, by the separation of opposing traffic streams with medians, by proper geometric design to accommodate merging and diverging vehicles, by the separation of heavy through movements from slow or circulating movements, and above all, by the physical segregation of pedestrians from vehicular traffic. All these devices have been employed wherever appropriate in the development of the Recommended Plan.

Exhibit 3.C shows locations where ten or more accidents were experienced during 1963, while Exhibit A.G in the Appendix indicates the experience at major intersections displaying high accident frequencies over a four year period. In recent years, the City of Sudbury has instituted a most excellent system of reporting accidents and preparing monthly and yearly tabulations of accident data: every accident is identified by grid coordinates, highway section, light conditions, weather, causes etc. By this means, the City has built up a wealth of accident information upon which to draw for the analysis of specific problem areas. This data should now be analyzed in detail and applied towards the elimination of situations conducive to accidents and generally, towards the development of a safer roadway system.

Comparison of Exhibit 3.C with others showing 24-hour traffic volumes, vehicle speeds and intersection capacities, highlights the most significant causes of accidents:

- Sections of substandard roadway
- High traffic volumes
- Capacity limitations and congestion

It will readily be seen from Exhibits 3.C and A.G that the worst locations are on Elm Street, Lorne Street and Notre Dame Avenue, where these contributing factors are most prevalent.

At "high accident" locations, the preparation and use of collision diagrams can be most helpful in identifying specific problems: the City Engineering Department should make a continuing study of collision diagrams to assist them in improving the safety of the street system.

3.4 AVERAGE DAILY TRAFFIC VOLUMES

Exhibit 3.D shows the 24-hour weekday traffic volumes on Sudbury's major roadways as determined by manual intersection and automatic traffic recorder (A.T.R.) counts. As would be expected, the highest traffic volumes are encountered on the most important arterial streets immediately adjacent to the downtown area. The most heavily loaded section was found to be that portion of the Kingsway between Carleton Street and Bancroft Drive, where more than 17,000 vehicles a day were being carried on a 36 feet wide roadway. The heavy flows here are only partly due to the designation of the Kingsway as a provincial highway route: the bulk of the traffic is generated or attracted by areas within the City, as the Kingsway serves New Sudbury and Minnow Lake to the east, and downtown Sudbury, Gatchell, and Lockerby to the west. Future growth of all these districts will increase the volume of this traffic movement: this report will discuss alternative ways of handling traffic in the Kingsway corridor.

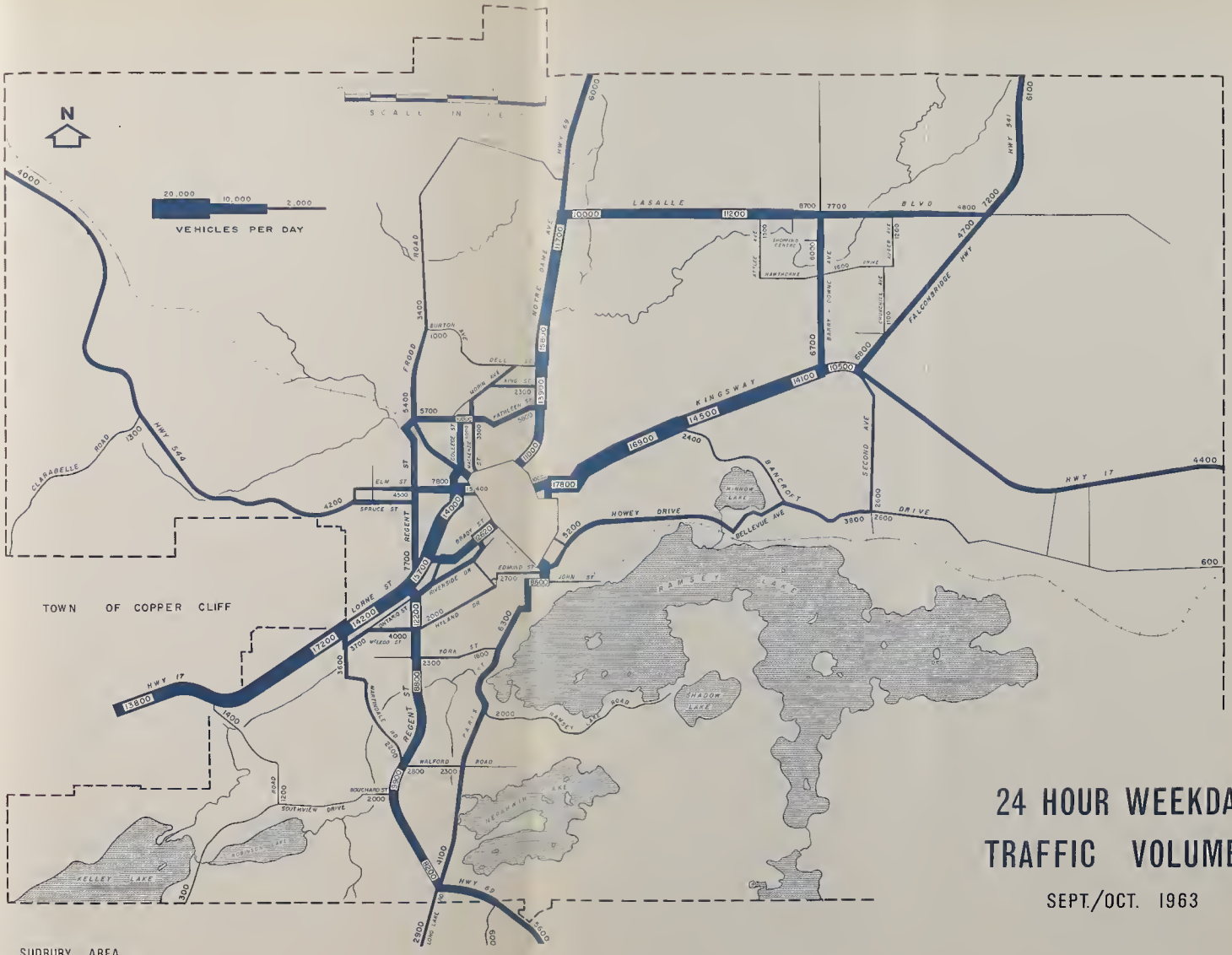
Other heavily loaded sections of the street system included:

- Lorne Street South (15,700 - 17,200 v.p.d. on a 42' roadway)
- Notre Dame Avenue (13,900 - 15,800 v.p.d. on a 36' roadway)
- Regent Street South (8,800 - 12,200 v.p.d. on a 40' roadway)
- La Salle Boulevard (10,000 - 11,200 v.p.d. on a 24' roadway)

The collection of traffic volume data for this Study was undertaken in September and October, 1963, and the volume pattern reflects that particular period. Traffic volumes usually vary through the year from a low in January to a high at the peak of the summer season, and the September/October counts presented here may be assumed to represent a mean value between the two extremes.

It is unfortunate that specific information on seasonal traffic fluctuations is not available for the City of Sudbury. For this and other reasons, it is recommended that the City Engineering Department institute a comprehensive counting program designed to accumulate a reservoir of traffic count data. Such data would allow more accurate interpretation of individual counts and provide basic information as a foundation for decisions on roadway needs and expenditures. The amount of traffic data compiled by the City in recent years has been minimal, and it cannot be too strongly stated that a well designed, broadly based traffic counting program is fundamental to the process of consolidating and updating construction and maintenance schedules, within the framework of an overall transportation plan.

Recent developments in "solid state" counting components and induction loops permanently buried in the roadway have considerably facilitated the simple and accurate recording of such traffic volume data. With careful organization and direction the provision of adequate traffic data could be of great benefit to the Engineer-Department and to City Council.



24 HOUR WEEKDAY TRAFFIC VOLUMES

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DILLON

EXHIBIT 3·0

In order for the traffic volume counts (Exhibit 3.D) to be meaningful and useful, they should be compared with a body of traffic data accumulated over a period of time, and interpreted in conjunction with other data including accident locations (Exhibit 3.C) and speed and delay studies (Exhibit 3.F).

It will be seen from the above mentioned Exhibits that heavy volumes, high numbers of accidents and severe congestion are occurring together, particularly on Lorne Street South, on Elm Street and on Notre Dame Avenue between Kathleen and Wilma Streets.

It is not simply the volume of traffic which is causing the problem at these locations, but rather a combination of high traffic load on sections of roadway with inadequate capacity and conflicts of movement caused by complicated intersections, or "friction" with the fronting properties.

Application of sound traffic and planning principles can greatly reduce the problems and conflicts in these areas, while at the same time increasing the traffic carrying capacity of the roadway network.

On Lorne Street, the provision of a new connection to Brady Street, combined with a grade separated interchange at Lorne and Regent Streets, improvements to other intersections and stringent control of frontage access are required.

To relieve Elm Street, a downtown distribution and bypass facility is required which will accommodate the longer and through movements, and make room for the local service and circulating traffic on the existing streets.

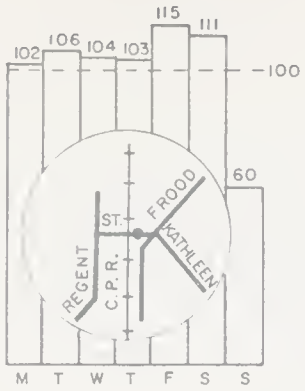
For Notre Dame Avenue, roadway widening is the first requirement, and this should be accompanied by complete prohibition of all parking on the traveled roadway. These measures should be followed by the closing of minor side streets and restrictions of driveway access: where possible, property access should be provided entirely by rear service lanes, and where driveways to the fronting main street are essential, their entry points and geometric design should be carefully controlled.

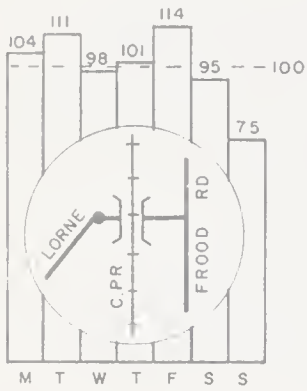
This concept of access control to improve the capacity and safety of a major street is of fundamental importance in the development of improvement plans, and every possible means for its achievement should be explored. Zoning bylaws, building codes and the issuance of curb cut permits are existing measures which may be adaptable in achieving control: purchase of access rights should also be considered at strategic locations.

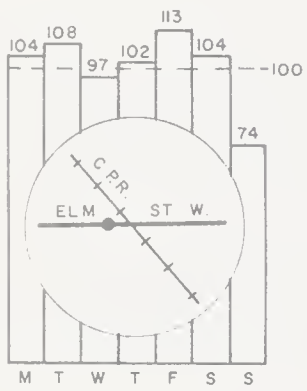
Many of Sudbury's major streets,including Lorne Street South, Regent Street South, Paris Street, Notre Dame Avenue, La Salle Boulevard, Kingsway and Falconbridge Road would benefit from some measure of access control: its value cannot be over emphasized.

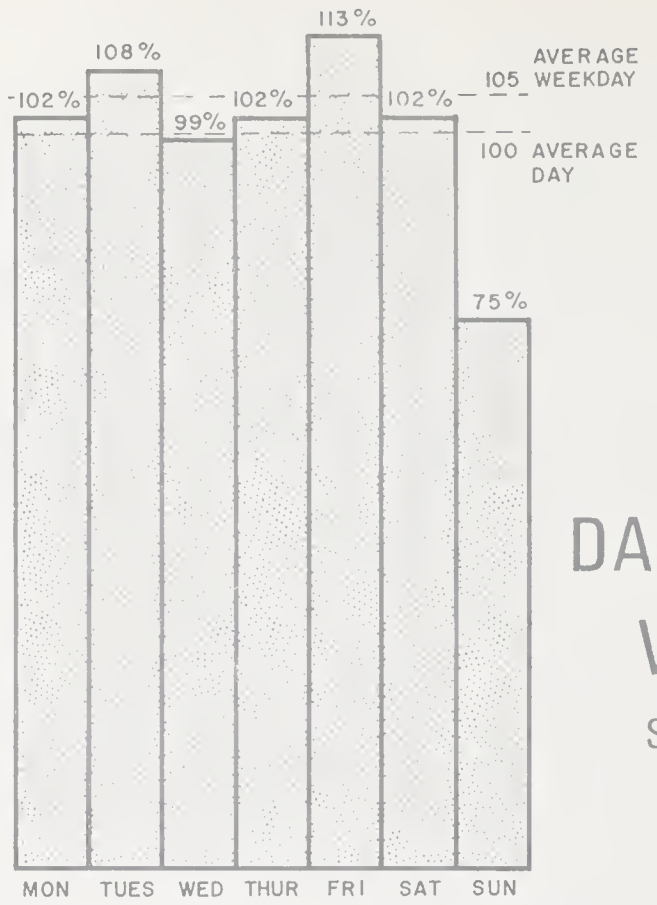
3.5 DAILY AND HOURLY VOLUME VARIATIONS

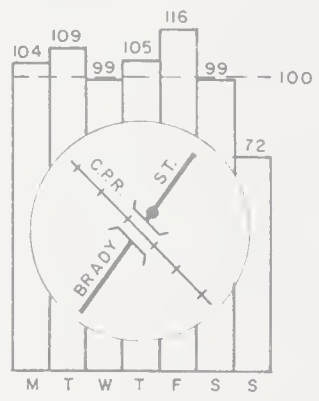
Exhibit 3.E shows cyclical variations of traffic volumes according to the days of the week, and during an average weekday at six counting stations

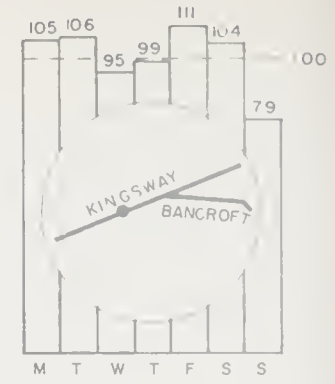


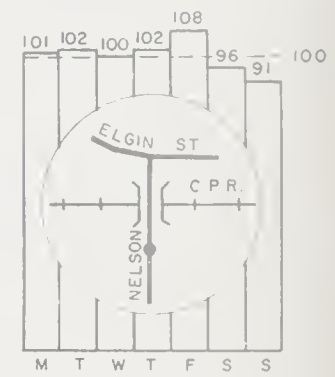






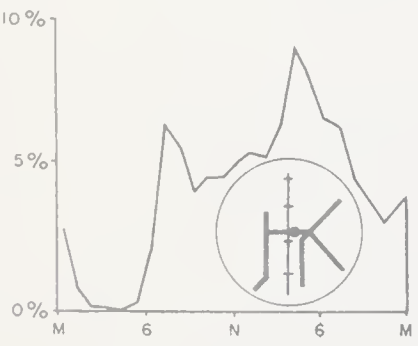


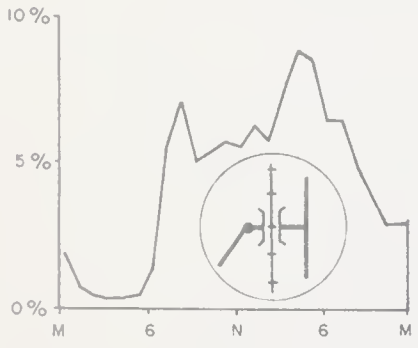


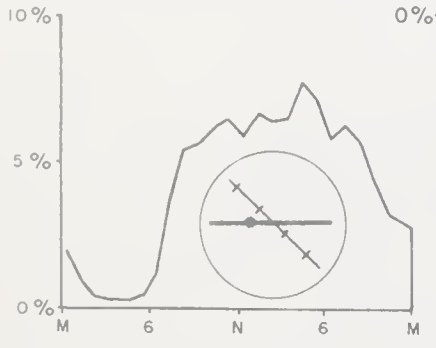


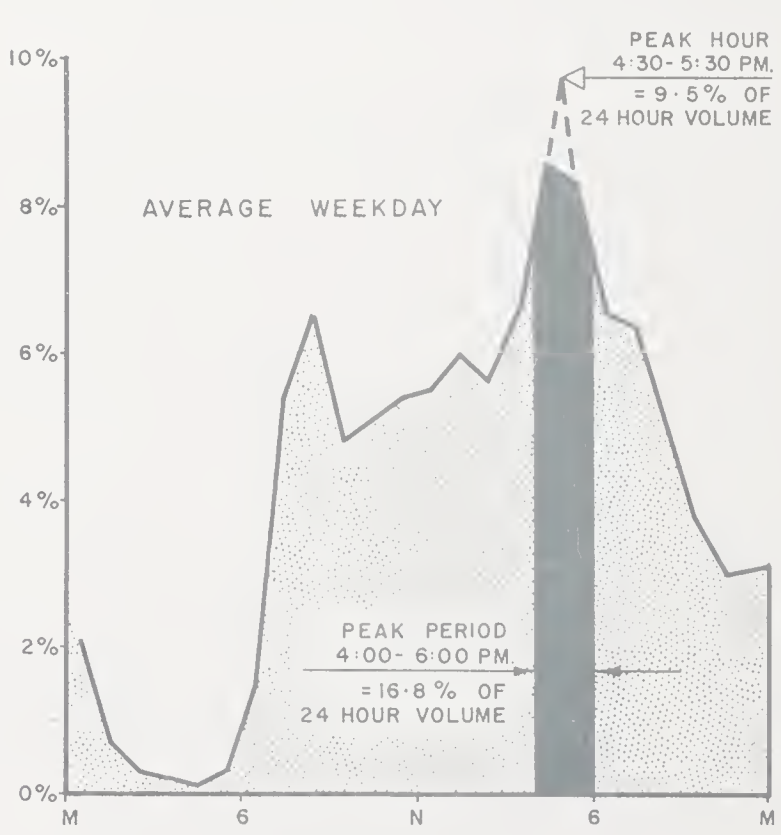
DAILY TRAFFIC VARIATIONS

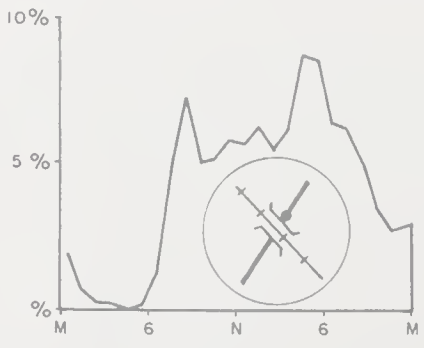
SEPT./OCT. 1963

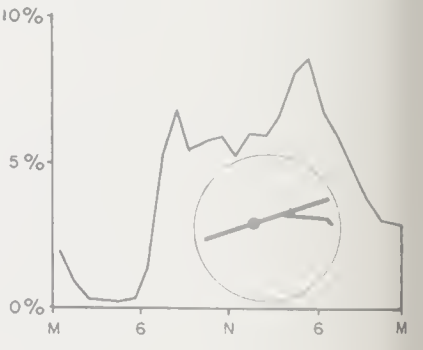


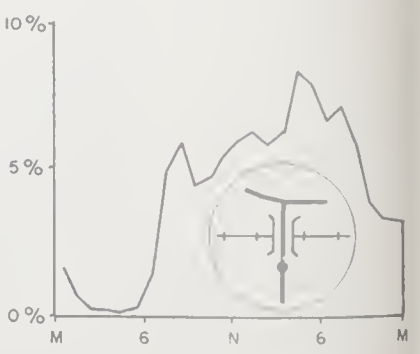












HOURLY TRAFFIC VARIATIONS

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around the downtown area. Each count spanned seven days or more.

It will be seen from the Daily Variations that the highest daily flows occur on Tuesdays and Fridays, when stores are open until 9:00 p.m. Most of the "extra" traffic on these days occurs between 7:00 and 8:00 p.m., producing flows which are as great as those in the peak morning rush hour. Sunday was found to be a relatively light day during the September study, the summer vacation traffic having dwindled. Wednesday is usually a below-average weekday due to early closing of the stores.

Public Holidays (Labour Day and Thanksgiving Day) which occurred during the Study resulted in flows some 20% below normal on the holidays themselves. The effect of this was to increase the traffic flows on the previous Friday (late shopping night) and Saturday. In addition, the following Tuesday (late shopping night) showed an increase in volume, and the following Wednesday also showed an increase because many stores abandon the usual 1:00 p.m. closing time on the Wednesday following a holiday. Thus, it was found that a Monday holiday affected the whole period from Friday to Wednesday inclusive. There being only five Monday public holidays during a year, the occurrence of the two during the eight-week period of the survey was abnormal, and for this reason they have been omitted from the presentations in Exhibits 3.B and 3.C, together with the other affected days cited above.

At most of the counting stations, the peak traffic volumes occurred between 4:30 p.m. and 5:30 p.m. Peak hour volumes usually represented between 8% and 11% of the 24-hour weekday volumes. In certain of the more outlying areas where trips to and from the mines constitute the predominant flows, the peak hour factor increased to the 11% - 13% range. In only one location (i.e. External Station No. 11 on Clarabelle Road) were abnormally high factors in the 18% - 30% range experienced. As shown on Exhibit 3.E, the average weekday peak hour volume based on the 7 day A.T.R. counts was 9.5% of the 24-hour volume.

In the calculation of 1963 intersection capacities actual peak hour volume measurements have been used. In estimating daily roadway capacities, for evaluation of 1985 roadway plans, a peak hour factor of 10.5% has been used on two way streets and a factor of 12.5% on one way streets (see Exhibit A.G., sheet 4).

A few of the 85 counting locations sited throughout the city, rendered data which varied significantly from the average. Of particular interest was that on Elm Street West at the C.P.R. As would be expected, daily traffic volumes tended to reflect the station's closeness to the shopping and office facilities of downtown, although its location on Highway 17 had a modifying effect upon the volume peaks. The most significant factor at this location, however, was that peak hour flows, particularly in the morning rush hours, are almost completely suppressed, which appears to indicate a capacity limitation on this route at the Elm/Lorne intersection. By contrast, the Kingsway carried a very marked peak

volume during the evening rush hour, indicating that no severe capacity limitations affected this section. As stated earlier, only a continuous counting program can reveal these characteristics and also provide a basis for their interpretation in sufficient detail to permit the City Engineering Department to design and operate an efficient street system.

3.6 SPEED AND DELAY STUDIES

The speed and delay survey was carried out as described in Section 2.4.8 and provided information on the operating characteristics of major streets, the locations and causes of congestion and the degree of delay occurring at the various trouble spots. While this information is interesting and useful in itself, its greatest value is to reinforce and expand the findings of other portions of the study including the traffic volume counts, capacity analyses and vehicle accident records.

Exhibit 3.F gives the results of the speed and delay survey in terms of vehicle running speeds and driver travel times. Exhibit A.H in the Appendix gives more specific information regarding speeds on major route sections, together with a detailed commentary based upon observations compiled during the survey.

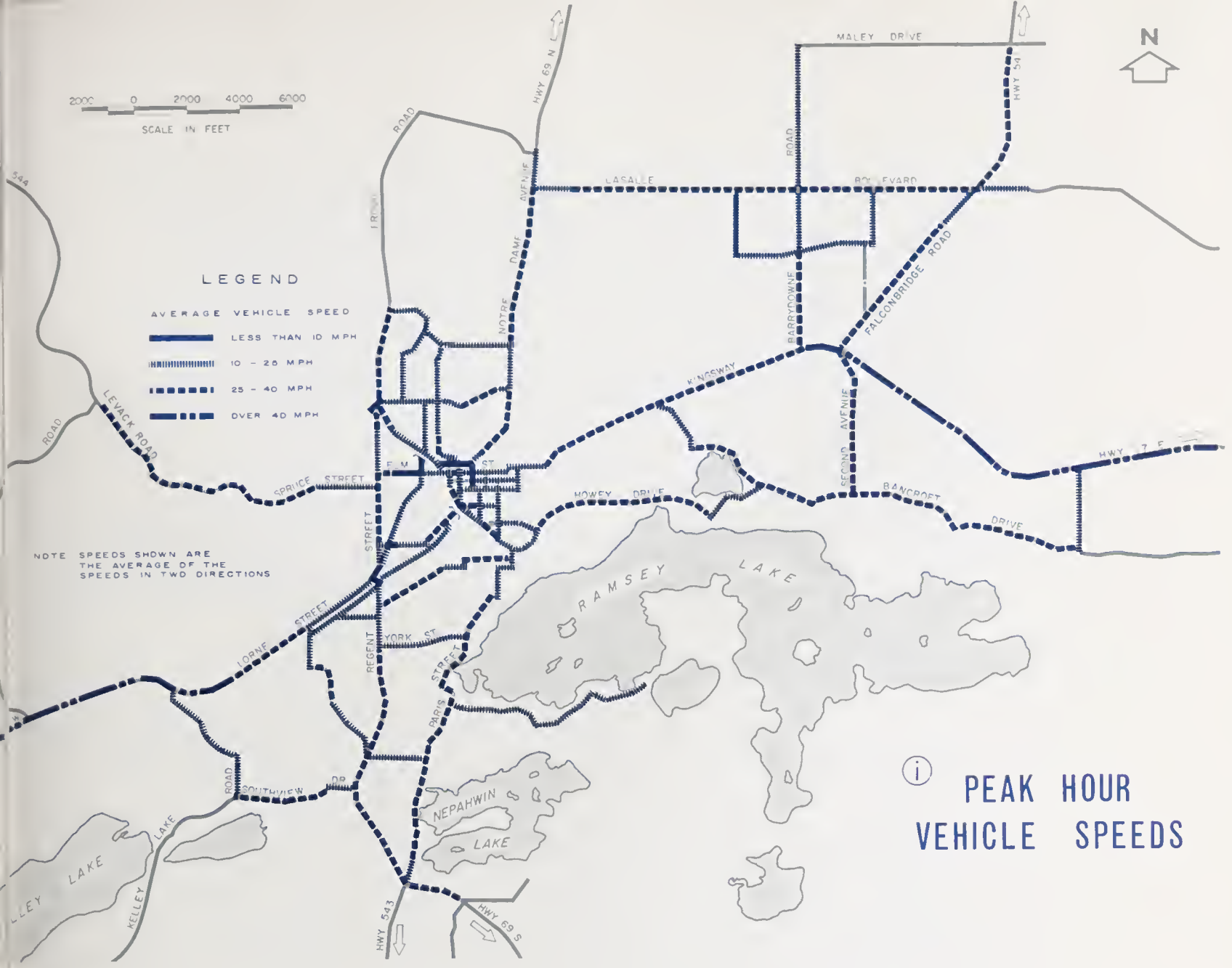
Exhibit 3.F (i) shows that the lowest speeds (less than 10 m.p.h.) occurred in downtown and at the railway crossings along Lorne Street. These low speeds were associated mainly with delays at signalized intersections where capacities inadequate to handle heavy intersecting movements caused congestion; it is noteworthy that these are also high-accident locations.

The majority of Sudbury's streets were found to operate in the 10-25 m.p.h. speed range. Speeds in the 25 - 40 m.p.h. range were attained only on arterial streets well beyond the downtown area, and on a few collector streets where there is better than usual alignment and very little side friction to slow down moving vehicles.

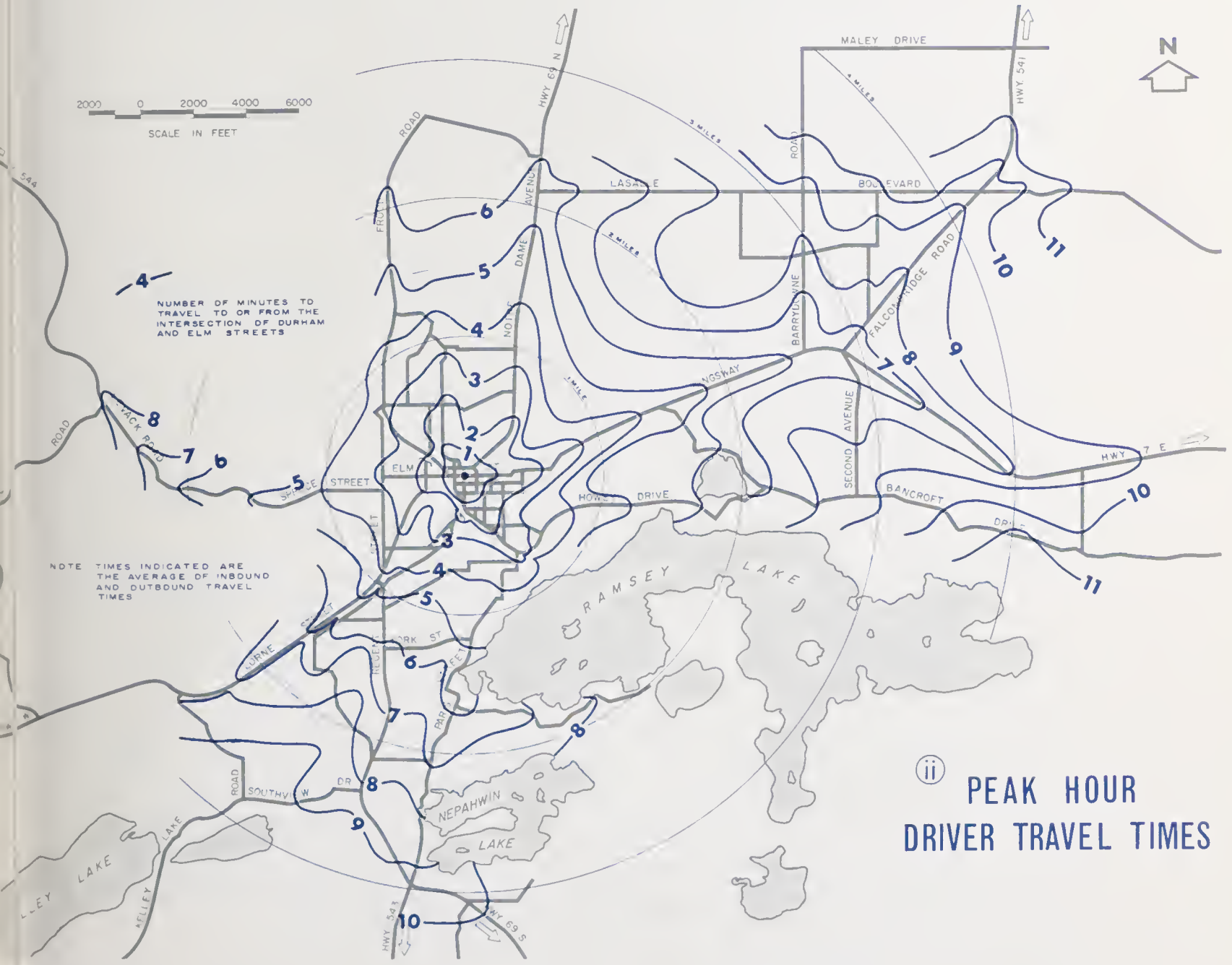
From the results of the speed and delay survey it is evident that improvements are required at certain locations of the major street system including:

- Lorne Street South (Highway 17) from Martindale to Regent and from Haig to Elm
- Regent Street South from York to Lorne
- Elm Street and Lloyd Street from Lorne to Kingsway
- Notre Dame Avenue north of Beech and Lisgar Streets and from Kathleen to Wilma
- Paris Street, Barrydowne Road and Falconbridge Road in the vicinity of Plaza 69, New Sudbury Shopping Centre and Falcon Plaza respectively

The isochronal chart (Exhibit 3.F (ii)) indicates the average peak hour travel time spent by drivers in reaching any point in the City measured from the intersection of Durham and Elm Streets. In an ideal system, these travel times would be directly comparable with the distance traveled along the major



(i) PEAK HOUR VEHICLE SPEEDS



(ii) PEAK HOUR DRIVER TRAVEL TIMES

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1963 SPEED and DELAY STUDIES

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routes. Most of the irregularities in the isochronal chart indicate congestion and delay on the major routes, or circuitous routings imposed by the roadway layout. One such effect is the inordinately lengthy time required to reach the New Sudbury Shopping Centre either via Notre Dame Avenue and La Salle Boulevard or via the Kingsway and Barrydowne Road The surveys showed that the Kingsway route was the more advantageous, although neither route represented a truly efficient connection between downtown and New Sudbury.

The recommendations of this transportation study include a series of measures, from new route proposals to intersection improvements, designed to facilitate speedier interconnection and provide adequate access for all the developed areas of the city.

3.7 ANALYSIS OF INTERSECTION CAPACITY

A further measure of the efficiency or otherwise of the street system is obtained by calculation of intersection capacities. The ratio between the measured traffic volumes and the calculated intersection approach capacities shows where additional traffic can be accommodated or where roadway deficiencies already exist. The capacity of a section of major street is controlled by the capacity of the intersections. Only in the case of a fully grade - separated expressway do factors other than intersection capacities influence the volumes which can be adequately handled, and even here, the characteristics of feeder streets and interchange ramps may limit the overall capacity of an expressway.

The calculated intersection capacities for all the signalized intersections in Sudbury are shown in Exhibit A.G,together with some discussion of the procedures used in the calculation and the factors which influence the results.

In downtown Sudbury,certain intersections operate with an exclusive pedestrian phase,and this is one factor which cannot be adequately allowed for in the capacity calculations.

From the capacity calculations it is apparent that the intersections of

- Lorne Street and Elm Street West
- Durham Street and Elm Street East
- Lisgar Street, Beech Street and Notre Dame Avenue
- Notre Dame Avenue and LaSalle Boulvard

are overloaded on two or more approaches. Several other intersections exhibit minor overloaded conditions and these would in most cases be relieved by retiming of the traffic signals during the afternoon peak period.

The details of signal timing have not been dealt with in the context of this transportation study since the City Engineering Department is fully capable of dealing with any necessary adjustments in the course of the normal week-by-week operations. Physical improvements of critical intersections and redistribution of traffic onto alternative routes form part of the recommended proposals contained later in the report.

3.8 ROADWAY - RAILWAY ALIGNMENT PROBLEMS

It is of some significance to note that many of Sudbury's traffic problems, as shown by the various surveys, occur where major streets closely parallel the railway facilities. Lorne Street South, Frood Road and Elgin Street South are examples of the difficult situations which arise when heavy traffic flows run adjacent to the railway tracks. Major intersections are widely spaced and heavily loaded, and are complicated by their proximity to an at-grade crossing or a structure. Right-of-way widths are restricted, and turning lanes and adequate corner radii are almost impossible to provide. Approach alignments and sight distances are often very poor, and the problems are compounded when a second intersection occurs on the other side of the railway tracks, or when there are intermittent commercial uses on the narrow strip between the railway and the roadway.

These situations have developed with the pattern of growth in the City because:

- The railways penetrated the area before the roads, and utilized the best routes, including the natural valleys.
- The downtown area developed northward from the C.P.R. station and filled the natural basin. With the pressure for further growth, downtown became compressed by the barriers of the railway on the south-west side and rocky outcrops on the north and east.
- As streets developed outward from the downtown area, they tended to follow easier routes, parallel and close to the railways, generating a series of difficult traffic situations.

The worst situation at the present time is the Lorne/Regent/Haig/Ontario/Riverside complex. At peak hour more than 3,000 vehicles approach this confined three-part intersection from eight separate directions. Considerable ingenuity is required to accommodate the major movements using linked traffic signals, and the presence of a train disrupts the normal patterns by blocking some of the most important flows. The resolution of the roadway and railway conflicts at this location will be both difficult and costly.

The recent construction of the Brady Street underpass dealt with another such problem situation. In this case the solution was achieved by underpassing both the railway and the adjacent roadway (i.e. Elgin Street).

An earlier underpass on Lorne Street North eliminated vehicle/train conflicts but did nothing to alleviate the traffic conflicts at the College/Lorne/Frood intersection, which has inadequate corner radii and poor visibility due to the structure.

The Elgin/Morris/Nelson/Lourdes intersection requires improvement, but the possibilities at this location are severely restricted by its proximity to the railway. The Regent/Kathleen crossing, the Martindale/Ontario/Lorne crossing, and to a lesser extent, the Douglas/Lorne and the Elm Street crossings

all exhibit more or less similar difficulties. This report will recommend means to alleviate many of these problems.

Wherever possible, it is recommended that the City's plans for new routes allow for a wide horizontal separation between roadway and railway alignments in order to provide adequate area for at-grade intersections, and to permit the installation of properly designed grade separations, as and when warranted.

During the course of this Study, proposals were examined which involved the upgrading of Frood Road and Morin Avenue. It became quite apparent that these routes would be plagued with the same problems of conflict as have been cited above; hence, such proposals have been given low priority.

3.9 RAILWAY CROSSING PROBLEMS

Section 3.7 has drawn attention to some of Sudbury's special problems arising from the close parallel alignments of certain major streets and the railway facilities in the City. Similar and closely related problems occur wherever the railway tracks cut across the street system.

A general review of the 24-hour Traffic Volumes shown in Exhibit 3.D indicates that much of the movement in the City of Sudbury occurs along a south-west to north-east axis through Copper Cliff, Gatchell, Lockerby, Downtown, New Sudbury, Garson and Falconbridge. The corridor is limited on the south-east by Ramsey Lake, and on the norht-west by the barren lands between the Copper Cliff slag dump and Frood and Stobie Mines. The movement along this axis amounts to more than 57,000 vehicles on an average day. It is concentrated in and around the downtown area and intersects the main line of the C.P.R. which forms the south-west boundary of downtown.

The S.W.-N.E. movements through the centre of Sudbury are concentrated at five railway crossing points along a 1 1/2 mile section of the C.P.R. tracks and yards as follows:

- 2 lane at-grade crossing from Regent Street North to Katheleen Street (7,700 vehicles/day)
- 2 lane underpass on Lorne Street North (10,600 vehicles/day)
- 4 lane at-grade crossing on Elm Street West (15,400 vehicles/day)
- 4 lane underpass on Brady Street (12,900 vehicles/day)
- 2 lane overpass on Nelson Street (11,142 vehicles/day)

Traffic movement on the S.W.-N.E. axis will continue to grow,and the need for adequate railway crossings in this section will continue to be one of the major problems requiring solution. This report will recommend further grade separations and measures to redistribute the traffic loads crossing the C.P.R. facilities.

The other important C.P.R. facility in Sudbury is the branch line to Sault Ste. Marie which runs alongside Lorne Street (Highway 17). At-grade crossings of this line occur at Kelley Lake Road, Martindale Road, Regent Street South and Douglas Street.

Problems occur at these locations as a result of a combination of factors: poor horizontal alignment on the approaches; poor vertical alignment over the crossing; restricted roadway widths; inadequate vehicle storage approaching the intersections on Lorne Street and poor geometrics at the intersections. Later in this report, a series of measures will be proposed to alleviate the special problems at these crossings.

It appears that the lands between Martindale Road and Kelley Lake Road formerly occupied by the C.P.R. creosoting plant may sometime be developed for industrial uses. In view of the problems already occurring along the C.P.R. branch line, it is most important that future access and traffic circulation plans for this area be well designed to avoid further difficulties. From the previous discussion it will be seen that direct access to Lorne Street from individual sites should be discouraged, and points of access should be well spaced and well aligned.

The C.N.R. facilities conflict with traffic far less frequently and directly than do the C.P.R. tracks and yards mentioned above, mainly due to their less extensive penetrations of the central area. The City should keep the conflicts which do exist under constant review, however, in order to develop plans for further grade separations as soon as these seem warranted.

There are several minor spur lines throughout the area, the most contentious probably being that which cuts diagonally through the downtown area immediately adjacent to the Elm/Durham intersection. Efforts should be continued towards the separation or closing of this and other such lines wherever feasible.

The resolution of the conflicts between the roadway network and the railway facilities in the City will be a major requirement of the transportation planning process throughout the 20 year period covered by this study.

3.10 CONCLUSIONS

Each of the specific surveys described in this chapter provides important and useful information on the operation of the street network. It is only when all the data are analyzed together, however, that a composite picture of the full nature and range of problem locations can be evaluated, and relief measures developed.

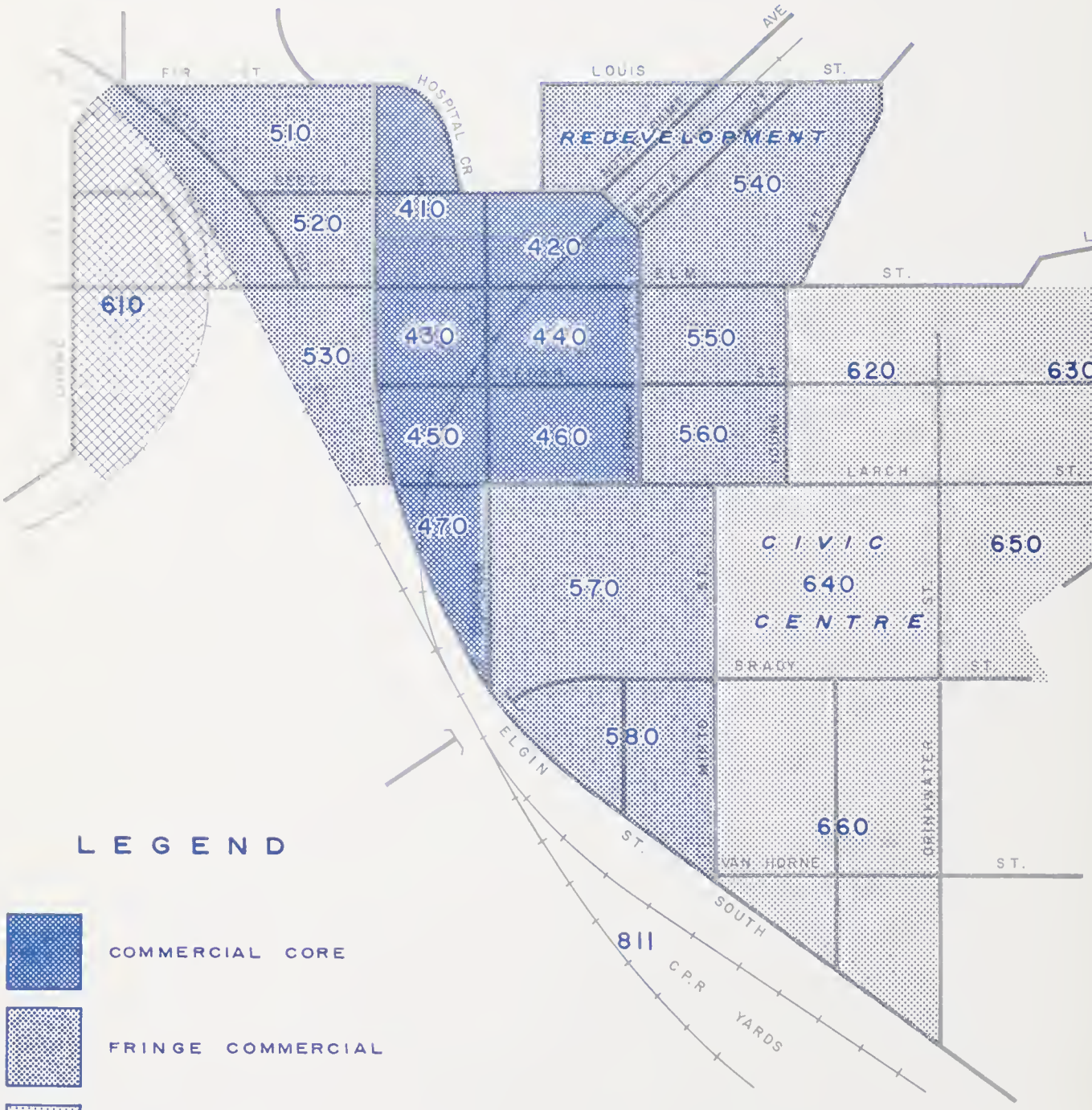
The analyses up to this stage in the study have indicated several locations, including Lorne Street South, Elm Street and Notre Dame Avenue, where major deficiencies exist. These can only be adequately dealt with in the framework of the Recommended 20-year Plan described later in this report. Other deficiencies revealed by the surveys are relatively minor in nature, and it is assumed that these will be

dealt with by the City Engineering Department within the context of their routine operating and maintenance procedures.

Much of the field data and the resulting analyses referred to in this chapter are presented in the technical appendix to this report.

Upon completion of the study, all relevant field notes, summaries and calculations will be deposited with the City of Sudbury Engineering Department. This data should be expanded and kept up-to-date as part of a continuing program by the Department to provide a guide to changes in travel patterns and a record of the effects of street improvements.

DOWNTOWN
O-D and PARKING ZONES



LEGEND

- COMMERCIAL CORE
- FRINGE COMMERCIAL
- RESIDENTIAL
- MIXED COMMERCIAL AND INDUSTRIAL

SUDBURY AREA
TRANSPORTATION STUDY

CHAPTER 4

DOWNTOWN TRAFFIC MOVEMENT AND PARKING

4.1 THE DOWNTOWN AREA

For the purposes of the Transportation Study, the Central Business or Central Traffic District includes the area from Lorne Street on the west to Carleton Street on the east, and from Fir Street on the north to Elgin Street south of Drinkwater Street on the south. To serve the requirements of the Origin-Destination Survey and the Parking Survey, the downtown area was subdivided into 22 zones as shown in Exhibit 4.A.

Zones 410-470 correspond with those blocks which form the core of the downtown area, as characterized by intensive commercial/retail and office uses.

Zones 510-580 constitute those areas immediately adjacent to the core which are substantially commercial, but which now contain residential and other less intensive, miscellaneous uses which may be expected to yield to commercial expansion within the 20-year planning period. Zone 540 is expected to be redeveloped as part of Sudbury's Urban Renewal Program.

Zone 610 is an area of mixed commercial and industrial development immediately west of the core and the C.P.R. It is anticipated that the land uses in this zone will change in the coming 20-year period partly due to the development of a business area west of Lorne Street in the vicinity of the Courthouse,and it will then become more closely allied with the C.B.D.

Zones 620-630 and 650-660 are primarily residential at the present time, and although they are contiguous to the commercial areas and lie within the natural basin in which downtown has been developed, it is thought unlikely that they will be exposed to strong pressures for intensive commercial development during the 20-year planning period. With respect to these zones,it may be noted that there is a continuing tendency for residential use of some of the larger properties to be displaced by medical clinics, funeral homes and similar community service uses.

Zone 640 is designated for the development of a Civic Centre complex, and most of this area is already in public ownership. The effects of Civic Centre development, together with the redevelopment and land use changes proposed for downtown by the Planning Board, have been reviewed and tested within the context of the 1985 projections described later in this report.

Zone 811, which represents the C.P.R. station and yard facilities,also forms part of the Central Business District by virtue of its position and the fact that access is via Elgin Street. The tracks running through Zone 811 form a barrier which is the boundary of the downtown area on the south-western flank.

4.2 TRAFFIC VOLUMES IN DOWNTOWN

In order to evaluate the traffic patterns and street operation in the Central Business District, a series of volume counts was carried out on downtown streets Exhibit 3.D has indicated the typical 24-hour weekday traffic volumes on much of Sudbury's major street network, which were derived from automatic traffic recorders. On downtown streets, however, the concentration of activities and the diversity of traffic movements indicated the need for more detailed manual counting methods. While automatic traffic counts were recorded at a few key locations, the bulk of the traffic volume counting in downtown was carried out by means of:

- classification of vehicles according to direction of travel and type of vehicle for the period 8:00 a.m. - 6:00 p.m. on all major roadways entering/leaving the area
- turning movement counts from 4:00 p.m. to 6:00 p.m. at all major intersections.

From these data, Exhibit 4.B, showing Peak Hour Traffic Volumes in the downtown area, was compiled.

Although this exhibit represents the peak period for work-to-home movements, it should be noted that the directional flows are very nearly balanced on most roadways, indicating the effect of through movements superimposed on those generated in downtown itself. In total, the outbound flows are higher than the inbound, reflecting the homeward movements of shoppers, office employees and others from downtown. However, the effect of substantial crossing movements - particularly in the S.W. - N.E. direction - tends to obscure the direct effect of homebound movement out of downtown. This further illustrates one of the underlying basic traffic problems in Sudbury: the topography, the layout of the street system and the orientations of trip desires all tend to funnel traffic through downtown, which in turn aggravates an already difficult traffic situation.

While every effort must be made to achieve optimum circulation efficiency on existing downtown streets with the aid of physical improvements, parking prohibitions, manipulation of traffic signal timing and any other available means, it is clear that further traffic growth must lead to more ambitious and imaginative projects. Furthermore, if the attractiveness of downtown is to be enhanced with new retail, business and civic developments, some reduction of traffic volumes on the street system would be desirable. Chapter 8 of this report recommends additional grade-separated crossings of the C.P.R. together with roadway improvements and new routes designed to convey traffic through and around the downtown area more effectively.

4.3 IN AND OUT MOVEMENTS AT THE DOWNTOWN CORDON

In order to analyze traffic movement across the downtown area, and to estimate the daily accumulation of persons and vehicles within the area, a cordon was established around the 22 zones mentioned above. At each major crossing point, a directional count of person and vehicle movements, including data on

DOWNTOWN

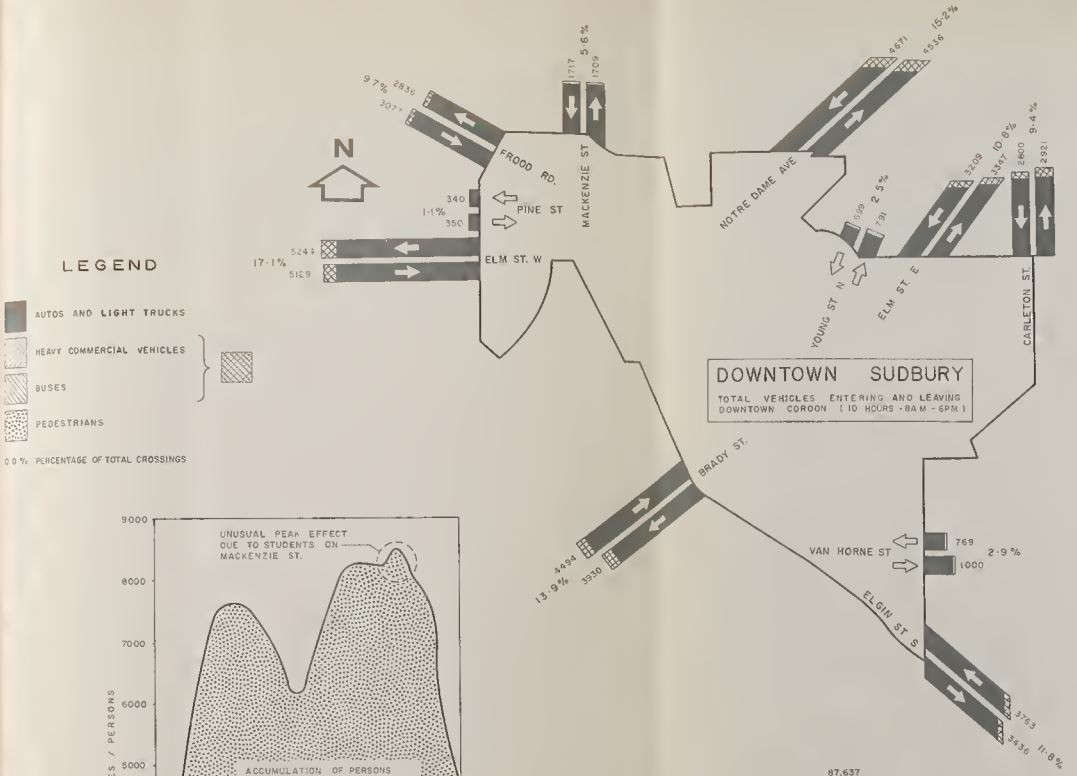
PEAK HOUR TRAFFIC VOLUMES

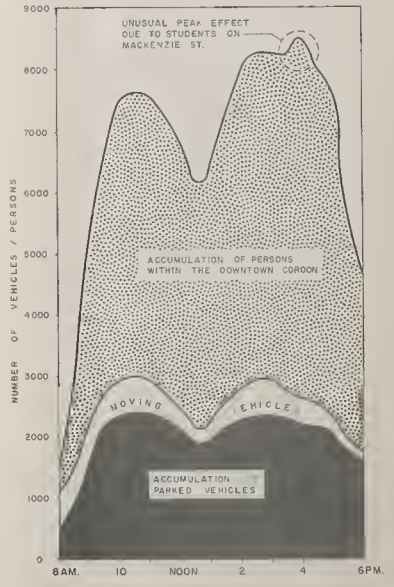
SEPT./OCT. 1963

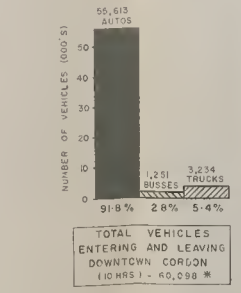
SUDBURY AREA TRANSPORTATION STUDY

DILLON

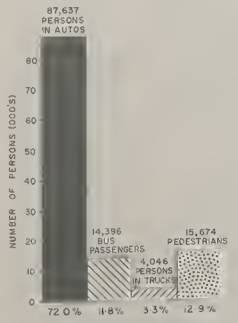
EXHIBIT 4-B



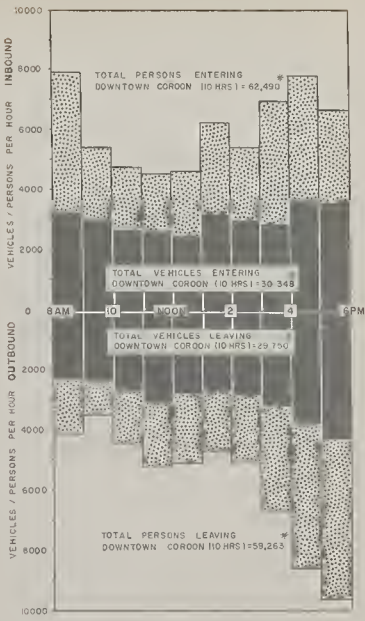

UNUSUAL PEAK EFFECT DUE TO STUDENTS ON MACKENZIE ST.
ACCUMULATION OF PERSONS WITHIN THE DOWNTOWN CORDON
MOVING VEHICLE
ACCUMULATION PARKED VEHICLES
NUMBER OF VEHICLES / PERSONS
8AM. 10 NOON 2 4 6PM.



TOTAL VEHICLES ENTERING AND LEAVING DOWNTOWN CORDON (10 HRS.) - 60,098 *



TOTAL PERSONS ENTERING AND LEAVING DOWNTOWN CORDON (10 HRS.) = 121,753 *


TOTAL PERSONS ENTERING DOWNTOWN CORDON (10 HRS) = 62,490 *
TOTAL VEHICLES ENTERING DOWNTOWN CORDON (10 HRS) = 30,348
TOTAL VEHICLES LEAVING DOWNTOWN CORDON (10 HRS) = 29,750
TOTAL PERSONS LEAVING DOWNTOWN CORDON (10 HRS) = 59,263 *
VEHICLES / PERSONS PER HOUR INBOUND
VEHICLES / PERSONS PER HOUR OUTBOUND
8AM 10 NOON 2 4 6PM

* NOTE PINE STREET TRAFFIC IS NOT INCLUDED IN THESE FIGURES BECAUSE DIRECTION, VEHICLE CLASSIFICATION AND NUMBER OF PERSONS, WERE NOT OBTAINED FROM THE A.T.R COUNTS AT THIS LOCATION

DOWNTOWN TRAFFIC MOVEMENTS

SEPT./OCT. 1963

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT 4-C

vehicle type and number of persons per vehicle, was made between 8:00 a.m. and 6:00 p.m. Certain of the data collected at cordon stations are shown in Exhibit 4.C.
The five most important entry points to downtown were shown to be: Elm Street West, Notre Dame Avenue, Brady Street, Elgin Street South and Elm Street East: these are closely followed in order of importance by Frood Road and Carleton Street. The daily peak vehicular movements into downtown occur between 8:00 and 9:00 a.m., 1:00 and 2:00 p.m. and 4:00 and 6:00 p.m., while the daily peak outbound movements occur between 11:00 a.m. and Noon and between 4:00 and 6:00 p.m.

Referring to the accumulation chart showing persons and vehicles within the downtown area, it is of interest to note that the lunch time movement of persons is a smaller proportion of the a.m. and p.m. accumulations than that of vehicles: apparently, that segment of the work force lacking the facility of private automobiles is somewhat less inclined to go home in the middle of the day. This illustrates a point that has been observed frequently in the analysis of these studies: while evaluating the needs and desires of automobile users, it is apparent that there exists a substantial number of bus passengers and pedestrians whose travel characteristics and needs are unique and must be given suitable consideration.

Although automobiles and light commercial vehicles make up 91.8% of the traffic entering and leaving the downtown area, it is significant to note that they convey only 72% of the persons into and out of the area. Hence, the relatively greater efficiency of buses is illustrated, in that although they represent only 2.8% of the total vehicles, they transport 11.8% of the total persons. Data collected appear to indicate that bus passengers number less than pedestrians, but it must be realized that some distortion is caused by the location of the downtown cordon. In point of fact, many of those classified as pedestrians do make use of buses, but the locations of bus stops, and major stores, hotels, offices etc. force them to walk across the cordon between their bus stops and their actual destinations. This unbalance was most marked in the vicinity of the schools located on MacKenzie Street, just outside the downtown cordon.

As well as their passenger-carrying efficiency, buses also offer the advantage that they require relatively little space in the downtown area for vehicle storage, i.e. parking. With reference to the bus operation in the central business district, the location and operation of the terminals could be subject to some rationalization: this is dealt with at greater length in Chapter 5.

The data on traffic movement in the downtown area provided important information on flow characteristics as these affect major streets and intersections. Furthermore the downtown cordon counts give an important indication of the through movements, and of accumulation of vehicles requiring parking in the area.

4.4 OBJECTIVES AND SCOPE OF THE PARKING STUDY

As outlined in the Terms of Reference and the Study Appraisal, the Parking Study was undertaken to investigate current parking characteristics and to secure data essential to a basic understanding of parker desires. It was designed to compile information about on-street and off-street facilities and usage, and to delineate areas of deficiency where a comprehensive study might be warranted to establish detailed requirements, prior to the construction of high unit-cost parking facilities.

The Parking Study was carried out in accordance with the procedures recommended for a "Simplified Parking Study", as described in Procedure Manual 3.D, prepared by the National Committee on Urban Transportation of the U.S. Public Administration Service. It comprised the following operations:

- a detailed inventory of parking spaces in the downtown area
- an 8-hour (10:00 a.m. - 6:00 p.m.) surveillance of parked vehicles
- 10-hour directional traffic classification counts at each point of entry into downtown

A brief description of survey methods is contained in Chapter 2, Section 2.4.9, while the results of traffic counts at downtown points of entry are shown in Exhibit 4.C and discussed in Section 4.3.

4.5 PARKING SPACE INEVENTORY

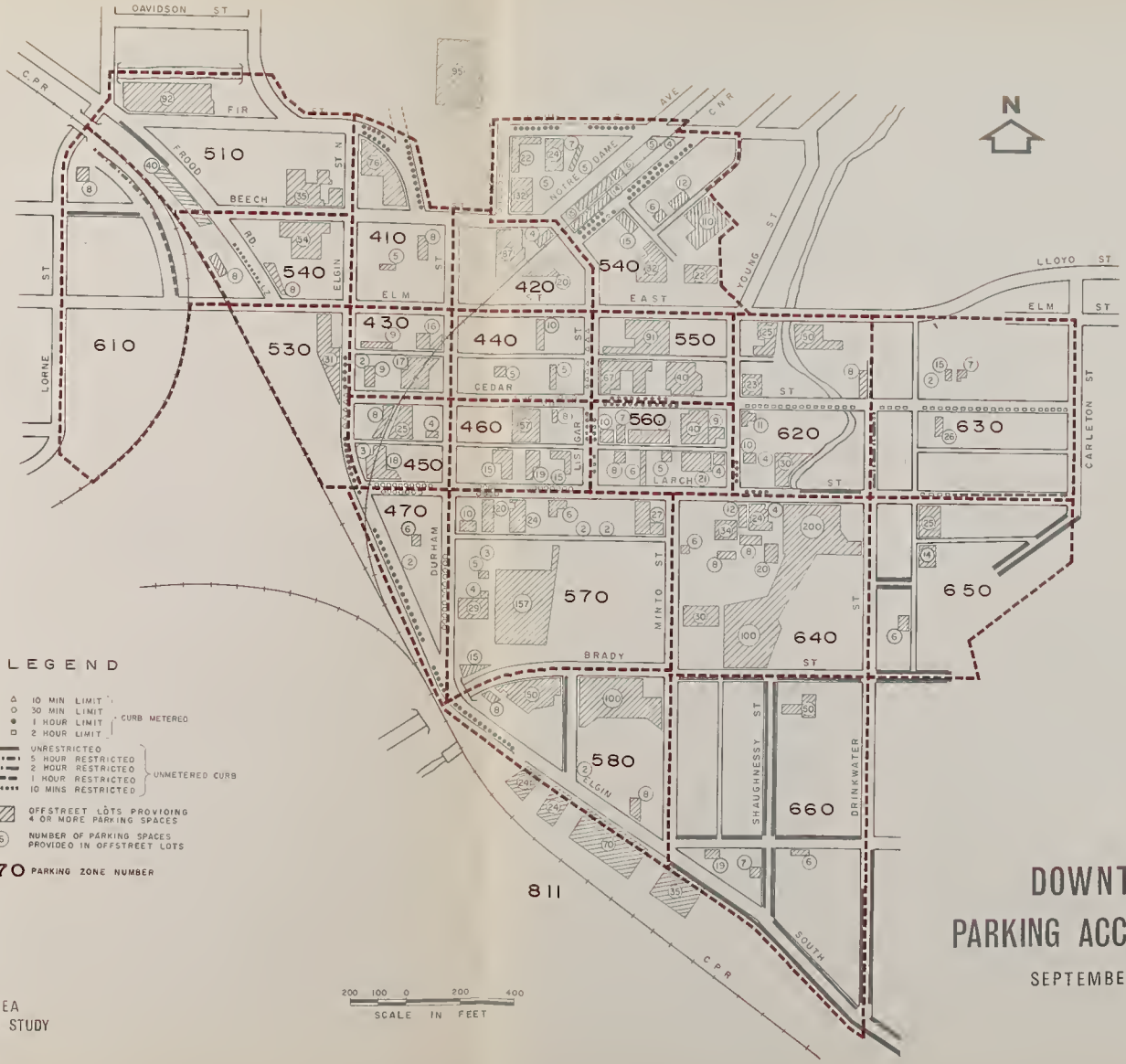
The inventory of parking spaces was carried out to determine the total number of spaces available in the downtown area, and to show how the parking supply was distributed with respect to type of parking and location.

As indicated in Exhibits 4.D and 4.E a total of 3,404 spaces were counted. Of these, 686 were available at the curb and 2,718 were provided in off-street lots. 291 of the curb spaces were controlled by parking meters and 1,489 of the off-street spaces were provided as paid parking by the Parking Authority and private commercial operators.

Both the total space provision and the proportion of curb facilities are less than the average of other cities of similar size throughout North America as tabulated by the Eno Foundation*. Although Sudbury has less than average parking accommodation, the usage surveys described in succeeding sections indicate that the supply is generally adequate.

The below average total supply appears to be adequate because the parking demands are well distributed throughout the day, as discussed later in this Chapter. The lower proportion of curb spaces is an outcome of the conditions and policies which prevail in Sudbury. In

* See "Parking" by Rovert H. Burrage and Edward G. Mogren, published by The Eno Foundation for Highway Traffic Control (1957).



DOWNTOWN PARKING ACCOMMODATION

SEPTEMBER 1963

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT 4-D

particular, the channeling of traffic through the central area dictates the elimination of curb parking on many major downtown streets.

It is most significant and encouraging to find that Sudbury is persuing a progressive and enlightened parking policy,and that the effects of this are evident both in the surveys of traffic movement and in the study of parking supply and demand.

While a number of persons and groups, including commercial interests and city departments, have combined to produce the healthy parking situation in Sudbury, the greatest impetus has undoubtedly been contributed by the operations of the Sudbury Parking Authority. Their activities, particularily in the development of off-street facilities, are to be commended.

In conjunction with the efforts of the Parking Authority, other agencies have considerable contributions to make to the provision of parking in downtown. The Sudbury Planning Board has already acknowledged its responsibility in the matter,and has given effect to its policies in plans for downtown. The City's zoning bylaw incorporates some elements of parking policy by providing that only hotels must make parking provision in conjunction with the development of downtown floor space, while it is optional for other types of development. It is an implicit requirement,therefore,that the bulk of the parking demands must be catered for by a specific,integrated program of parking development sponsored by public or private agencies.

The need for adequate parking accommodation with high standards of design and operation will continue to be one of the most vital requirements in the downtown area,and great diligence will be required to ensure that the planning and development of parking accommodation keeps pace with changing conditions and growing demands.

It is usual in a parking study of this type to consider off-street parking lots in two or more categories: this can be done most usefully according to whether or not the space is paid for by the user. During the preliminary stages of this Study, it was the intention to classify Sudbury's off-street parking facilities into FREE LOTS and PAY LOTS, and the inventory was carried out on this basis. However, when the results of the inventory were examined further, it became apparent that the classification of USERS according to whether or not they made payment for space occupied would be a most difficult task, and moreover, an exercise of doubtful value once completed. Difficulties arise from the fact that public lots and many of the private lots offer special terms for shoppers, patrons and employees of nearby commercial/retail and office premises. Rebates offered included "1 HOUR FREE PARKING FOR CUSTOMERS OF....." "10 MINUTES FREE PARKING" and "PARKING STAMPS ACCEPTED". With so many user discount plans in operation, it obviously became impractical to record parking space usage on the basis of FREE PARKING and PAID PARKING. Hence, all off-street facilities are considered in combination throughout the remainder of the parking usage survey.

One item of some interest concerning user rebates in downtown is that subsequent to this Parking Study, an

(v) PARKING CHARACTERISTICS *
by TYPE OF PARKING (10:00a.m. - 6:00p.m.)

	Space Inventory	Vehicles Parked	Turnover	Space Hours Available	Space Hours Used	% Usage
Curb Unrestricted	239	502	2.1	1912	1399	73.2
Curb Limited	105	197	1.9	840	290	34.5
2 hr. Meters	56	301	5.4	448	192	42.8
1 hr. Meters	167	1580	9.4	1336	1130	84.6
30 min. Meters	56	658	12.0	448	375	83.7
10 min. Meters	12	219	18.2	96	70	72.9
Legal Parking in Loading zones, Alleys, etc.	51	200	4.0	408	132	32.3
Illegal parking Locations	-	735	-	-	571	-
Free Lots	1229	6398	2.4	9832	11355	54.8
Paid Lots	1489			11912		
TOTAL	3404	10790	3.1	27232	15514	57.0

(vi) NUMBER OF VEHICLES PARKED *
by TYPE OF PARKING and by LENGTH OF TIME PARKED (10:00a.m.-6:00p.m.)

Type of Parking	1/4 hr.	1/2 hr.	3/4 to 1 hr.	1 1/4 to 2 hrs.	2 1/4 to 3 hrs.	3 1/4 to 5 hrs.	5 1/4 to 7 3/4 hrs.	8 hrs. and over	TOTAL VEHICLES PARKED
Curb unrestricted	100	61	74	52	46	44	75	50	502
Curb limited	72	31	37	23	7	9	10	8	197
2 hr. meters	118	70	69	42	1 X	-	1 X	-	301
1 hr. meters	651	370	341	150 X	30 X	25 X	9 X	4 X	1580
30 min. meters	335	145	124 X	44 X	4 X	2 X	2 X	2 X	658
10 min. meters	184	24 X	7 X	4 X	-	-	-	-	219
Legal Parking in Loading zones, Alleys etc.	102	42	30	16	6	2	2	-	200
Illegal Parking Locations	460	100	76	38	21	19	12	9	735
Off-street Lots	1412	981	1285	1138	516	425	378	263	6398
TOTAL VEHICLES PARKED	3434	1824	2043	1507	631	526	489	336	10790

X Figures marked thus represent vehicles parked overtime.

(vii) REPORTED NUMBER OF AUTOMOBILES PARKED * *
by DRIVER DESTINATION and by TYPE OF PARKING (Typical Weekday 24hrs.)

Driver Destination Zone	Street Free	Street Metered	Lot Free	Lot Paid	Garage Serv.etc.	TOTAL VEHICLES
410	83	136	235	199		653
420	82	31	125	146		384
430	47	55	193	108	41	444
440	295	241	288	485		1309
450	90	248	116	233	42	729
460	162	118	197	283		760
470	44	119	33	81	13	290
510	195	17	412	86		710
520	58	39	383	61		541
530		11	161			172
540	266	204	510	228	9	1217
550	21	57	453	127	67	725
560	11	70	133	49	12	275
570	84	49	292	97	61	583
580	46	54	159	30	9	298
610	40	48	834			922
620	32	42	116			190
630	69	158	200	22		449
640	12	32	126	28		198
650			105			105
660	199		241			440
TOTAL VEHICLES	1836	1729	5312	2263	254	11394

(viii) EXISTING and FUTURE VEHICLE TRIPS * *
by ZONE OF DRIVER DESTINATION
(Typical Weekday 24hrs.)

Zone	1963	1985
410	1494	2130
420	774	1657
430	848	1397
440	2431	2675
450	1322	1183
460	1496	1753
470	533	1064
510	1191	3096
520	1179	1960
530	261	315
540	2465	3208
550	1426	2789
560	558	1604
570	1231	3845
580	626	758
610	1489	3317
620	374	2793
630	991	6902
640	418	5938
650	224	270
660	831	5723
TOTAL	22162	54371

* Data in (v) and (vi) compiled from the Parking Survey.

* * Data in (vii) compiled from the Home Interview O-D Survey.

* * * Data in (viii) taken from the 1963 and 1985 Trip Tables.

DOWNTOWN
PARKING CHARACTERISTICS
SEPTEMBER 1963

(i) INVENTORY OF PARKING SPACES * by ZONE and by TYPE OF PARKING

Zone	Free Curb	Metered Curb	Loading Zones etc.	Free Lots	Paid Lots	TOTAL SPACES
410	-	23	12	22	76	133
420	-	-	-	24	87	111
430	-	-	8	53	-	61
440	-	13	-	20	-	33
450	-	10	7	33	25	75
460	-	22	-	57	57	136
470	-	37	10	8	-	55
510	-	-	-	40	127	167
520	20	-	1	-	54	75
530	-	20	4	31	-	55
540	-	62*	4	87	320	473
550	-	9	5	11	187	212
560	-	19	-	84	40	143
570	-	4	-	121	186	311
580	6	20	-	68	100	194
610	71	-	-	16	-	87
620	8	24	-	131	30	193
630	27	28	-	50	-	105
640	-	-	-	246	200	446
650	66	-	-	45	-	111
660	146	-	-	82	-	228
TOTAL SPACES	344	291	51	1229	1489	3404

* Includes Off-Street meters in Market Lot

(ii) NUMBER OF VEHICLES PARKED * by ZONE and by TYPE OF PARKING (10:00 a.m. - 6:00 p.m.)

Zone	Free+ Curb	Metered Curb	Illegal Curb	Off-Street Lots	TOTAL VEHICLES	Turn-over
410	-	231	50	330	611	4.6
420	-	-	45	323	368	3.3
430	1	-	11	147	159	2.6
440	2	208	54	8	272	8.2
450	37	76	23	179	315	4.2
460	-	217	53	440	710	5.2
470	19	366	47	18	450	9.0
510	-	-	16	571	587	3.4
520	40	89	82	213	424	5.7
530	34	247	20	46	347	6.3
540	31	483	93	819*	1426	2.9
550	9	86	34	1274	1403	6.6
560	6	179	19	430	634	4.4
570	29	35	20	584	668	2.1
580	5	169	35	203	412	2.1
610	120	58	13	8	199	1.9
620	14	141	3	269	427	2.3
630	2	179	20	126	327	3.1
640	-	-	-	477	477	1.1
650	80	-	12	16	108	1.0
660	274	-	85	107	466	2.1
TOTAL VEHICLES	703	2764	735	6588	10790	3.1

\+ Includes legal loading zones

* Includes parking at off street meters

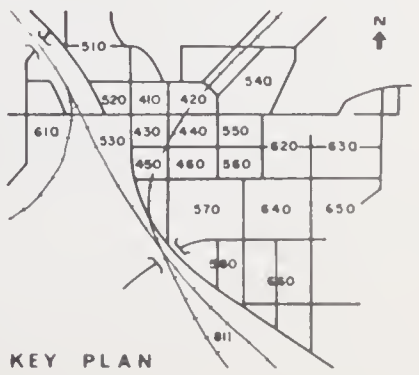
(iii) NUMBER OF VEHICLES PARKED * by ZONE and by LENGTH OF TIME PARKED (10:00 a.m. - 6:00 p.m.)

Zone	1/4 hr.	1/2 hr.	3/4 to 1 hr.	1 1/4 to 2 hrs.	2 1/4 to 3 hrs.	3 1/4 to 5 hrs.	5 1/4 to 7 3/4 hrs.	8 hrs. and over	TOTAL VEHICLES PARKED
410	148	107	159	133	32	21	7	4	611
420	73	59	87	82	29	19	9	10	368
430	36	24	22	29	12	18	9	9	159
440	204	36	15	7	2	4	2	2	272
450	101	72	51	47	14	10	11	9	315
460	268	136	154	82	15	20	4	31	710
470	213	92	85	38	8	9	2	3	450
510	141	122	128	88	37	27	19	25	587
520	180	74	68	53	24	12	8	5	424
530	162	69	56	39	7	11	2	1	347
540	410	234	250	194	87	100	100	51	1426
550	580	281	272	174	49	29	15	3	1403
560	228	107	145	78	30	19	18	9	634
570	87	83	173	160	78	45	21	21	668
580	142	71	72	32	26	27	21	21	412
610	47	30	22	29	17	15	25	14	199
620	93	64	70	68	43	24	35	30	427
630	115	55	58	37	12	16	16	18	327
640	82	31	54	86	52	46	102	24	477
650	25	3	10	11	20	16	12	11	108
660	99	74	92	40	37	38	51	35	466
TOTAL VEHICLES PARKED	3434	1824	2043	1507	631	526	489	336	10790

(iv) AVAILABLE SPACE HOURS and USAGE by ZONE *

Zone	Spaces	ALL DAY (10:00 a.m. - 6:00 p.m.) Available Space Hours	ALL DAY Space Hours Used	ALL DAY % Usage	MORNING PEAK HOUR (10:15 - 11:15 a.m.) Space Hours Used	MORNING PEAK HOUR % Usage	AFTERNOON PEAK HOUR (2:30 - 3:30 p.m.) Space Hours Used	AFTERNOON PEAK HOUR % Usage
410	133	1064	658	61.9	77	57.9	101	75.9
420	111	888	524	59.0	68	61.3	74	67.2
430	61	488	325	66.5	44	72.1	41	67.2
440	33	264	143	54.3	22	66.7	20	60.6
450	75	600	397	66.2	56	74.7	61	81.3
460	136	1088	785	72.1	118	86.8	113	83.1
470	55	440	320	72.8	41	74.5	43	72.7
510	167	1336	870	65.1	122	73.1	123	73.7
520	75	600	420	70.0	47	62.7	55	73.3
530	55	440	266	60.5	36	65.5	32	58.2
540	473	3784	2421	64.0	332	70.2	344	72.7
550	212	1696	1148	67.7	181	85.4	156	73.6
560	143	1144	707	61.8	100	70.0	86	60.1
570	311	2488	1138	55.4	187	60.1	157	50.5
580	194	1552	661	42.6	75	38.6	90	46.3
610	87	696	476	68.4	61	70.1	60	70.0
620	193	1544	910	58.9	122	63.2	123	63.7
630	105	840	508	60.5	63	60.0	72	68.6
640	446	3568	1443	40.5	213	47.8	195	43.7
650	111	888	325	36.6	46	41.4	41	37.0
660	228	1824	1070	58.5	141	61.8	136	59.6
TOTALS	3404	27232	15515	57.0	2152	63.3	2123	62.4

* Data in (i) (ii) (iii) and (iv) compiled from the Parking Survey.



KEY PLAN

SUDBURY AREA TRANSPORTATION STUDY

DILLON

agreement was entered into between the Parking Authority and private operators providing for the universal acceptance of parking validation stamps; i.e. stores may now distribute stamps to customers for use at any downtown parking lot. Such a system may go far towards increasing the competitive position of downtown with respect to suburban shopping centres and other shopping facilities outside the downtown area, providing free customer parking.

4.6 PARKING TURNOVER AND USAGE

This portion of the parking study was undertaken to determine whether the available parking spaces are fully utilized on a typical September weekday.

In the event that facilities should prove to have inadequate capacity during this period, it is evident that they would be quite incapable of accommodating peak parking demands at weekends or during the pre-Christmas shopping day period.

As mentioned above, the total provision of downtown parking spaces as well as the percentage of curb parking within this total, are substantially below the average characteristics based on city size.

Considerable study was made of this particular point, and it appeared that several different factors combined to make this situation more understandable than it initially appeared. In the first place, the hourly variations of parking within downtown Sudbury, as shown by the accumulation of parked vehicles in Exhibit 4.C indicate that there are two peaks (i.e. from 10:15 to 11:15 a.m. and from 2:30 to 3:30 p.m.) Exhibit 4.E (vi) shows these peaks to be approximately equal in magnitude: the consequent "sharing" of the peak demand between morning and afternoon periods helps to reduce the intensity of the peak. Of course, it is possible that peak demands are being SUPPRESSED due to capacity limitations of the available facilities; however, calculations of per cent usage discussed later in this Chapter do NOT suggest a significant under-supply.

It is important to note that much of the employment in Sudbury involves shift work in the mines and associated industries. This appears to spread activity within the central business district over a greater portion of the day by allowing more persons to make shopping and business trips during the morning hours. Such a distribution of activity helps to dilute peak parking demands, and thereby to improve the operating characteristics and efficiency of parking facilities.

A third factor in analyzing the Parking Study is that because of the 1:00 p.m. closing of stores on Wednesdays, surveillance in the core area was confined to the four remaining weekdays. On two of these, i.e. Tuesday and Friday, stores remain open in the evenings until 9:00 p.m.: the effect of this is to distribute parking demand further throughout the day.

All these factors tend to enhance the operation of parking facilities by distributing parker demands. Thus, Sudbury appears to have a generally adequate supply of parking facilities, although the total number of spaces is somewhat less than the average found in other cities of comparable population.

The tabulations in Exhibit 4.E indicate that a total of 10,790 vehicles used parking facilities during the 8-hour period from 10:00 a.m. to 6:00 p.m., giving an average turnover of 3.1 vehicles per space. 4,202 vehicles, or 39% of those parked, used curb spaces while the balance (6,588 vehicles) were accommodated by off-street facilities.

The zones surrounding the Durham/Elm intersection exhibit the highest turnovers. These result from two factors:

- DEMAND exceeds SUPPLY, so that available spaces are heavily used, and
- the spaces provided in this central core are largely short-term metered spaces with comparatively high parking fees (30-minute and 10-minute meters having average turnovers of 12.0 and 18.2 respectively for the 8-hour period.

This generally indicates the desirable situation where operation and enforcement of meter regulations permits a relatively large number of short-term parkers to use a relatively small number of metered spaces, while those requiring longer-term parking use facilities farther from the centre of the shopping area.

In contrast with the highly developed commercial zones (e.g. turnovers 4.6, 3.3, 8.2 in zones 410, 420, 440 respectively) those areas on the fringes of downtown, where free curb parking is permitted, exhibit very low turnovers (e.g. 2.1, 1.1, 1.0 in zones 570,640, 650 respectively).

The average turnover at non-metered curb locations is 2.1 vehicles per space where posted time limits are 2 hours, and 1.9 vehicles per space where there are no time limits. This indicates very few daily movements amongst those users who manage to park their cars at the curb without payment. This is lower than the average for off-street facilities (2.4 vehicles per space) where the imposition of charges generally results in more frequent movement of parked cars and shorter parking durations. Exhibit 4.F portrays parking turnover by zones diagrammatically.

Exhibit 4.G is a diagrammatic representation of parking space usage; i.e. the ratio between the SUPPLY of parking space and the DEMAND expressed in space hours of occupancy. The available space hours are calculated by multiplying the total spaces reported in the inventory by the duration of the survey (8 hours). The space hours used are calculated as the product of the number of vehicles parked and the duration of parking.

The calculation of space hours available and used in the different zones and facilities further illustrates those tendencies exhibited by the turnover tabulations. Over the survey period, the parking accommodation available was 3,404 spaces or 27,232 space hours, while during that period, 10,790 vehicles used 15,514 space hours for an overall usage of 57.0 per cent. The usage is generally higher than this figure in the core of the central area, and it is notable that high degrees of usage are attained in zones 550 and 560, which also have relatively large numbers of spaces available.

FREE CURB

344 SPACES

699 VEHICLES

TURNOVER
2·0 VEHICLES
PER SPACE

METERED CURB

291 SPACES

2768 VEHICLES

TURNOVER
9·5 VEHICLES
PER SPACE

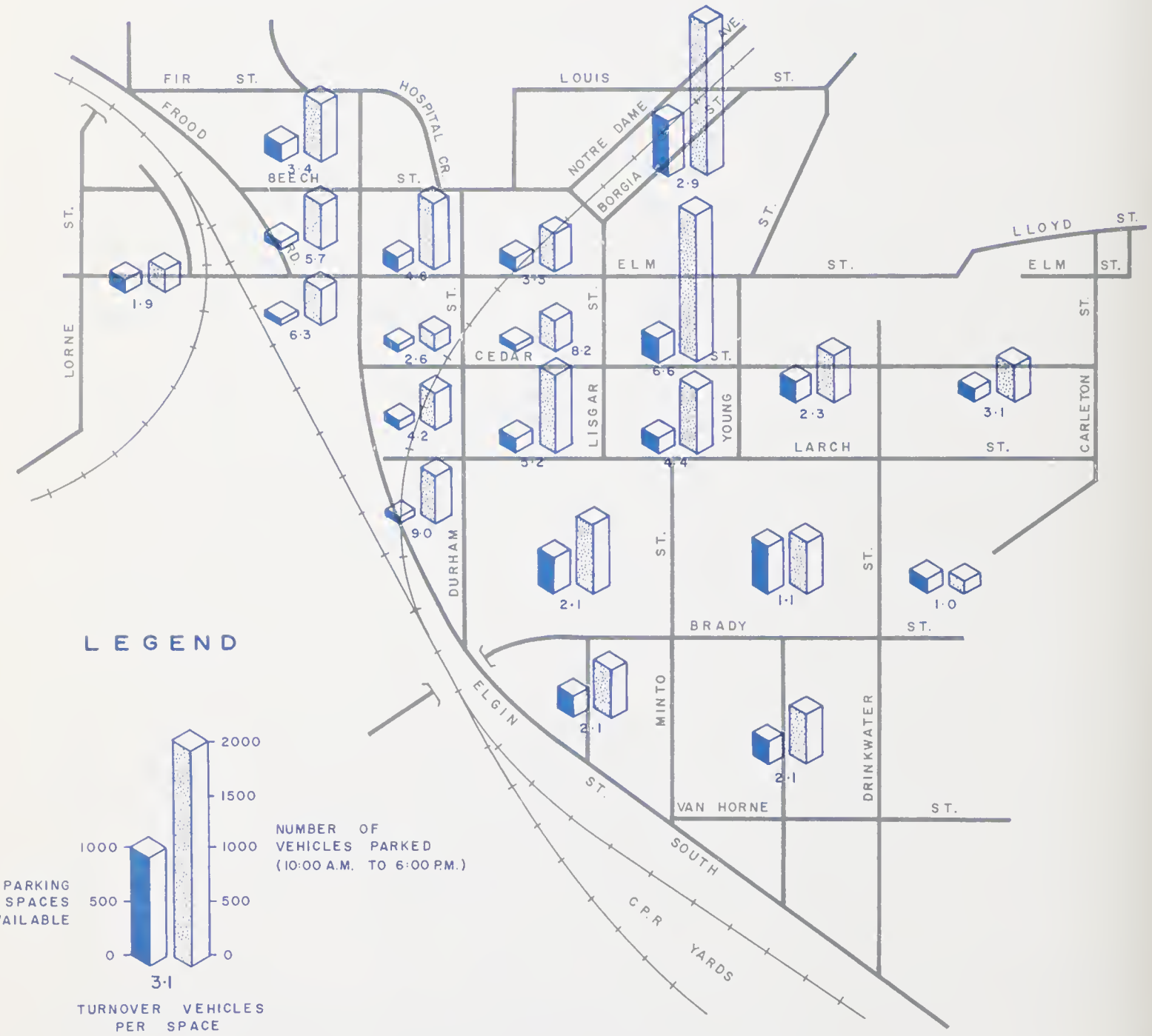
OFF STREET LOTS

2718 SPACES

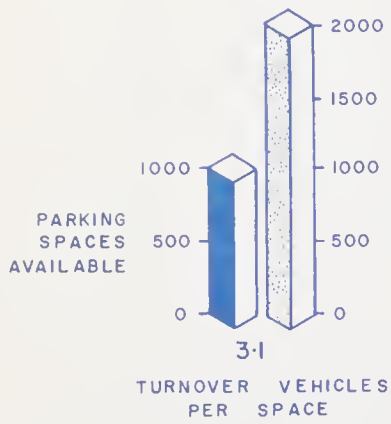
6398 VEHICLES

TURNOVER
2·4 VEHICLES
PER SPACE

(i) TURNOVER BY TYPE OF PARKING



LEGEND



(ii) TURNOVER BY ZONE

: Data compiled from Parking Survey.

SUDBURY AREA
TRANSPORTATION STUDY

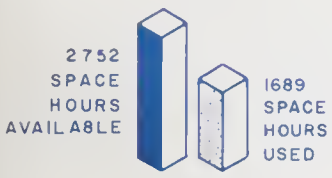
DILLON

DOWNTOWN PARKING TURNOVER

SEPTEMBER 1963

EXHIBIT 4·F

FREE CURB

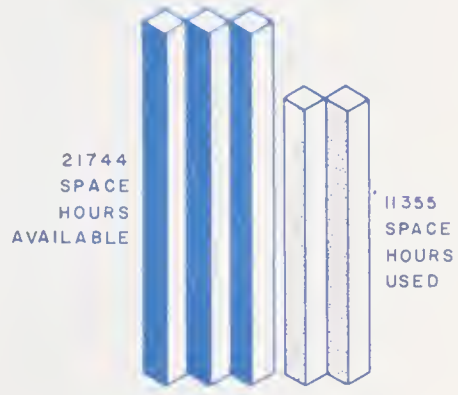


USAGE 61·4%

METERED CURB

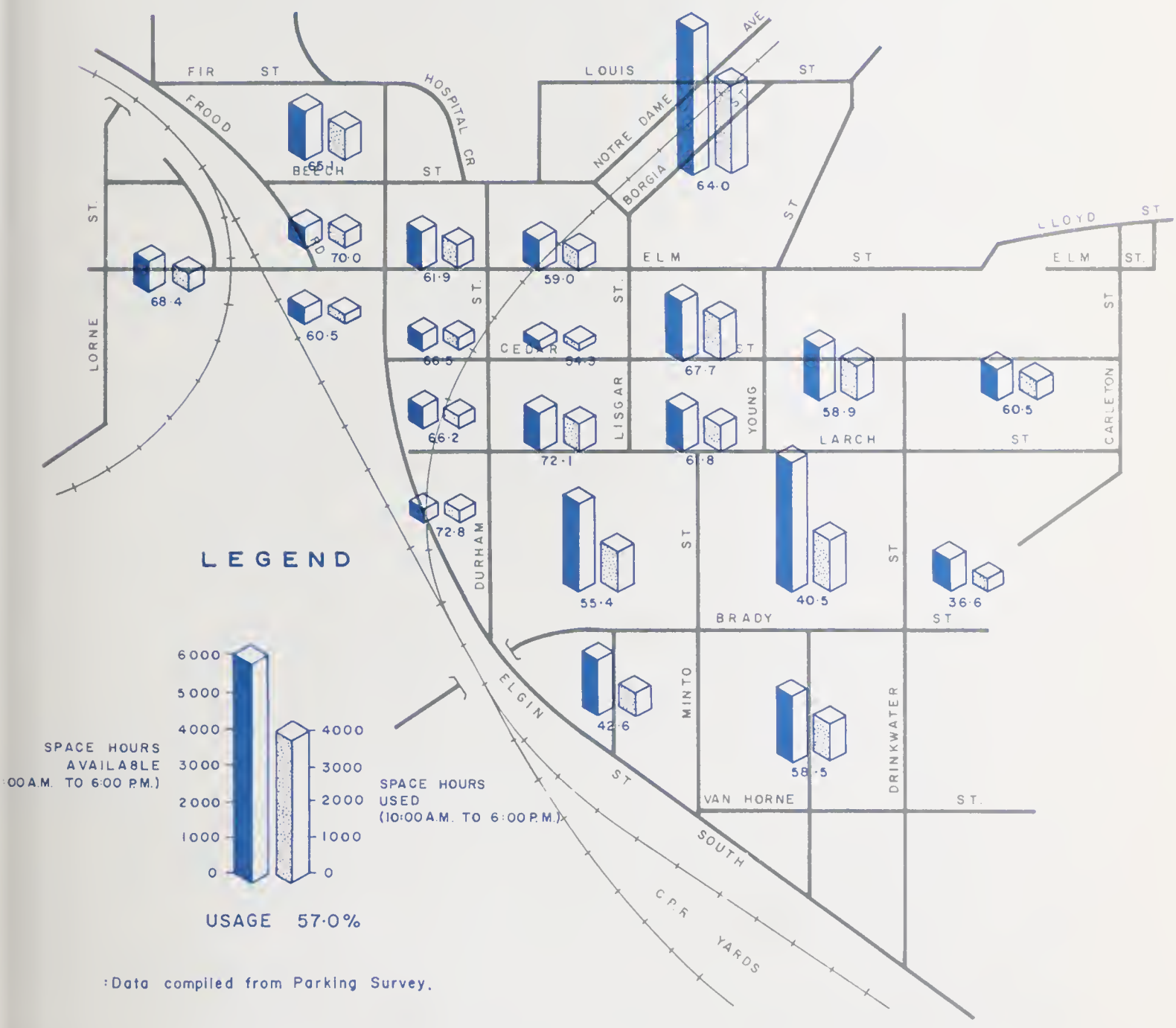
USAGE 75·9%

OFF STREET LOTS

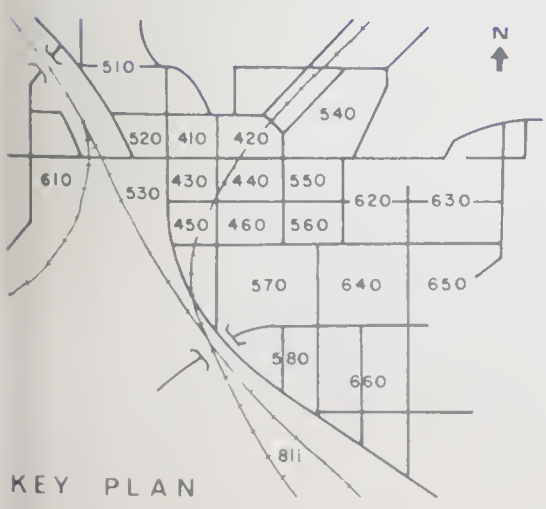


USAGE 54·8%

(i) SPACE USAGE BY TYPE OF PARKING



:Data compiled from Parking Survey.



(ii) SPACE USAGE BY ZONE

DOWNTOWN

PARKING SPACE USAGE

SEPTEMBER 1963

In this calculation, as in the parking inventory, the number of spaces available in a lot has been based on the assumption that customers will normally park and lock their own car. The "Self Park" system requires allowance for maneuver space at the front or rear of each row of vehicles; however, it is recognized that several of the private parking facilities in Sudbury operate with parking attendants acting as "car jockeys". When drivers assign their cars to "car jockeys", the lot capacity can be increased by the elimination of the maneuvering space.

Except for the fairly minor distortions in the space usage figures attributable to "car jockey" operation, the percentage usage figures in Exhibit 4.G are representative of the 8 hour demands. In reviewing the figures, a usage of 85% is usually considered a practical maximum. A facility catering to all-day customers might achieve a usage higher than this without any undue inconvenience to drivers seeking a space, but a high-turnover facility would not normally exhibit the 85% usage level.

Table (iv) on Exhibit 4.E shows that usage exceeds 85% in the morning peak hour in zones 450 and 460 and they also approach the same figure during the afternoon peak. Table (v) shows that the usage of 30-minute and 1-hour meters exceeds 80% THROUGHOUT THE 8 HOUR DAY.

It is quite apparent that much of the parking accommodation provided in the blocks corresponding to zones 460 and 550 is temporary in nature, and indeed, some 60 spaces have been removed from zone 550 since the time of the survey, to make way for new buildings on Cedar Street. It appears from these figures, that there is some unsatisfied demand for parking in the Elm-Lisgar-Cedar area, and proposals by private interests to develop a parking garage next to the City Hall would appear most logical, assuming this facility will be integrated with the City's requirements for the ultimate downtown circulation system.

The high usage figures at the 30-minute and 1-hour meters indicate the valuable contribution they are currently making to the parking supply in downtown. In spite of this, it is doubtful whether these meters will continue to provide useful parking service in downtown Sudbury. Inevitably, the requirements of traffic circulation and movement will force the elimination of most of the present curb parking spaces, and any which do remain in operation will cater to the very short term (10 - 15 minute) user in the same way as the metered spaces which currently serve customers of the Post Office and L.C.B.O.

Although these studies show no substantial deficiency in existing (1963) parking provision, it must be constantly emphasized that changing conditions will continually increase the need for permanent, well designed public off-street parking facilities.

4.7 PARKING DURATION

The tabulations of parking duration in Exhibit 4.E provide further confirmation of the basic parking characteristics described above. The short-term parker will try to park as close to his destination as possible; he will compete with other such parkers for the relatively few short-term meters provided close to the

major attractors (10-minute meters are provided outside the Post Office and the Liquor Control Board), and he is generally willing to pay the comparatively high price for occupying prime space.

The more leisurely shopper will not usually compete for the short-term metered curb space, but will be satisfied with the comparatively cheaper and more easily accessible space provided in a parking lot, if it is not at too great a walking distance from his ultimate destination.

The downtown employee will seek free parking space at the curb, or will make use of the comparatively cheaper parking lots some distance from the centre of the downtown area. Moreover, he will be willing to walk some distance to his destination.

In addition to the general parker characteristics shown by the tabulation of parking duration, some indication is given of the amount of overtime parking occurring at meters. Such overtime parking, taken in conjunction with the record of persons failing to pay meter fees, constitutes a measure of the adequacy of parking regulation enforcement. The degree of enforcement revealed by the Sudbury Parking Study was average, and Drinkwater Street was the only area where somewhat stricter enforcement of prevailing restrictions would appear to be warranted.

4.8 DATA FROM THE O-D SURVEYS

The External Cordon Interviews, the Truck/Taxi Interviews and the Home Interviews all produced data on the destinations of vehicle drivers. That portion of the trip table referring to driver destinations in the downtown area, has been reproduced in Exhibit 4.E (vii).

In addition, the Home Interviews included a question on type of parking used. The responses of drivers destined to the downtown area have been recorded, in Exhibit 4.E (vii). It will be seen that the responses from the Home Interviews agree moderately well with the tabulations from the Parking Survey, when allowance is made for the fact that O-D data cover a 24-hour period, and exclude Truck/Taxi trips and trips through the External Cordon, while Parking Survey data cover only the 8-hour period 10:00 a.m. - 6:00 p.m.

The Home Interview data are somewhat similar to that which would be obtained by interviewing drivers within the context of a Comprehensive Parking Study. It should be remembered, however, that the 1 in 8 sample used for the Home Interview Survey is far less than that which would be required to examine detailed parking requirements adequately in a segment of the downtown area. Hence, the Home Interview data should only be applied with caution.

4.9 CONCLUSIONS AND RECOMMENDATIONS FOR DOWNTOWN PARKING

The basic characteristics of parking in downtown Sudbury are shown in Exhibits 4.D, 4.E, 4.F and 4.G.

The Parking Study was carried out in September, 1963, and since records of the Parking Authority indicate that this was a period of approximately average demand,

the results may be considered fairly typical of spring or autumn conditions (i.e. demand somewhat less than during the peak Christmas period). It is normally expected that parking usage will vary according to a yearly cycle of activity, although the figures of vehicles parked and revenue supplied by the Parking Authority for the years 1961-63, do not give a very clear indication of this. To evaluate the changes in parking demand over a longer period, considerable volumes of monthly and annual data are required, and some means should be found to allow for the effects of specific modifying factors, such as a major work stoppage at the mines, additional supply of parking space by competitive private operators, the diversion of shoppers to new shopping centres and prolonged adverse weather.

From the results of the Study, it appears that the private parking operators and the Parking Authority are jointly providing an adequate supply of parking space in downtown Sudbury and that, with the help of the Sudbury Police Department, they are adequately controlling and regulating parking practices.

From the observations, it is clear that the Sudbury Parking Authority has made a most valuable contribution to the economic health and prosperity of downtown Sudbury by its work in the parking field during the past few years. In the years to come, the operations of the Parking Authority will be ever more vital to the growth and development of the central business district, which is the hub of an extensive regional area.

Although the Parking Authority has been in existence for less than ten years, its role and functions have been changing during that short period, and these will continue to change in the years ahead. The early history of the Parking Authority saw considerable development of off-street lots, while more recently there has been more emphasis on the operation of the established parking facilities. Now the Parking Authority must look forward to a challenging future: on the one hand, the existing stock of parking spaces will be constantly eroded as the requirements of traffic movement and land development cause successive removals of parking meters and "temporary" parking lots. On the other hand the increased traffic movement and the additional building will themselves lead to greater demands for parking space, to the point where it is predicted that parking facilities will require expansion from 3,400 spaces to 7,000 spaces over the 20-year period covered by the Transportation Study.

In this situation, it becomes a matter of utmost importance for the Parking Authority to develop a clear, written statement of policy. Such a policy statement would be a most important public relations gesture, because it would delineate the scope and objectives of the Parking Authority for the many other persons and agencies who are intimately concerned with parking operations. Indeed it would go far deeper than this, by providing the guiding principles for the development of comprehensive plans and programs for investment and service in the coming years.

Such a written policy might open with a statement setting down the organization and composition of the Authority *(what it is)* and continue with an explanation of the reasons for its establishment *(why it exists)*, and what it seeks to achieve in terms of services, standards and priorities. In this context it is most important to state whether prime service is to be given to shoppers and "short duration" patrons who comprise 70% of the users (see exhibit 4.E); how it seeks to attract and accommodate the longer term, steady (monthly) parker; to what extent it intends to develop sources of revenue for future expansion of facilities; and what balance it is striving to maintain between these sometimes competing purposes. In addition, the Parking Authority should state the means by which it proposes to achieve these purposes *(how it works)*, in terms of operating and regulating existing facilities and planning and developing new facilities to serve future requirements, in terms of off-street lots and parking structures coordinated and integrated with the access, circulation and development plans of the City.

One important aspect of operating policy should be the development of a recognized procedure for the progressive removal of curb parking and on-street meters in the downtown area. As traffic grows, curb parking must be eliminated, and the Parking Authority should anticipate the removal of meters on such streets as Elgin, Durham, Lisgar, Cedar and Larch Streets. In certain cases, it may be adequate to proceed with meter removal and leave the users to find accommodation in nearby facilities, but obviously a better procedure would be to develop off-street facilities and schedule meter removal in conjunction with the opening of the new facilities, so that a changeover is properly programmed IN ADVANCE of the other traffic requirements.

Various basic requirements for parking policy and parking facilities were set forth by Mr. W. E. Ewens, Consulting Engineer, in his report dated November 20, 1956, and although Sudbury has seen far reaching changes in the intervening years since this report was presented, many of those original precepts are still valid and are reinforced by the specific findings of the present Parking Study.

All the survey and analysis data presented in this report are intended to assist the Parking Authority and other interested agencies in reviewing the existing situation while preparing and achieving their future plans and programs. In addition to the data already presented, certain further information may be derived from the results of the home interview survey, but such additional work should only be undertaken in response to specific questions by the agencies concerned.

Referring to some of the details of the Study, heavy parking usage is shown to occur around the Lisgar/Cedar intersections and at the 30 minute and 1 hour meters. While the situation was not such as to warrant any immediate action, the changes in parking supply and demand should be the subject of continuing study so that plans may be developed to offset either increased demand or loss of parking space.

While the Simplified Parking Study undertaken as described herein gives a good indication of parking practices which relate to the overall transportation study, it does not provide a detailed picture of the amount and type of parking DEMAND.

As the growth and development of downtown reduces the number of available parking spaces to the point where existing facilities become seriously overloaded or otherwise inadequate, then a Comprehensive Parking Study of the 7-block core area, including the frontages of Beech Street, Elm Street, Cedar Street, Larch Street, Frood Road, Elgin Street, Durham Street and Lisgar Street, should be undertaken to determine the desirable location and economical size for one or more parking garages.

The development of the downtown area to the extent indicated by the Planning Board in their projections of floor space may require the provision of DOUBLE the present number of parking spaces. Any plan of this scale, however, must include multi-use development where parking and other facilities form part of an integrated design. If development of the magnitude suggested by the land use figures occurs during the next 20 years, it is clear that an immense parking program will have to be launched, and that substantial emphasis will have to be given to public transportation as an integral element of the overall design concept.

CHAPTER 5

PUBLIC TRANSPORTATION IN SUDBURY

5.1 PURPOSE AND SCOPE OF THE TRANSIT STUDY

When the Terms of Reference for the overall traffic study were being drawn up, it was apparent that certain phases of the study, particularly the Home Interview survey, would yield considerable useful data concerning person trips on the bus system. At about this ame time, a difficult competitive situation was developing between the various bus operations in the City, and it was generally agreed that data pertinent to public transportation should be extracted and tabulated together with such other useful information as the consultant could assemble during the course of the study.

Under the terms of the study appraisal, the consultant undertook to hold discussions with management officials of the transit companies, to collect speed and delay data on bus routes and to determine transit service areas. The appraisal stated that home interview data would be analyzed and presented as a separate chapter of the report, together with discussion and any pertinent recommendations.

While it was recognized that this data, by itself, without recourse to policy decisions and economic information, could not solve the jurisdictional and operational problems confronting the City and the bus companies, nevertheless it was felt that the assembly of factual bus travel data would provide a background against which to evaluate future decisions.

The following discussions, together with the attached exhibits, and the data contained in the appendix to this report, show the passenger characteristics and the operation of buses within the City of Sudbury as they existed at the time of the study (September/October 1963). Further data of a more detailed nature is contained both in the punched cards representing the home interview records and in a series of tabulations prepared from the punched cards. All this information will be deposited with the City at the completion of the study assignment for their continuing use.

5.2 ORGANIZATION OF THE TRANSIT SYSTEM

Prior to Sudbury's amalgamation in 1960, Sudbury Bus Lines Limited had a franchise to operate within the City Boundaries. Two other companies operated from bus stations within the downtown area: Local Lines Limited, on comparatively long-distance routes serving Copper Cliff, Azilda/Chelmsford/Levack, Hammer/Capreol and Garson/Falconbridge; and Nickel Belt Coach Lines Limited serving the Minnow Lake area and Coniston. In addition to the above, a special bus route to Frood Mine was operated by Delongchamp Cartage Company Limited. The Sudbury Bus Lines' franchise appears to have expired when major revisions were applied to the City Boundaries in 1960, but the various companies continued to operate their previously designated routes without any major modification in either territory or organization.

In 1962, another company, Yellow Coach Lines Limited, began operations with a partly subsidized route to the Benvenuto Apartments on Regent Street South, and certain school bus commitments. Yellow Coach Lines Limited also duplicated some existing routes of other companies, and established certain new routes, e.g. the connection from Minnow Lake to the New Sudbury Shopping Centre. Consequently, the older established companies undertook some re-routing and re-scheduling to better compete with the operations of the newcomer, all of which tended to create instability in bus operation throughout the entire area. Indeed, this was quite apparent at the time of the traffic surveys in 1963.

Since 1963, yet another company, Laurentian Bus Lines Limited, has commenced operation with services to the Laurentian University campus and elsewhere: the effects of these latter operations will not, of course, be reflected in any of the data or analysis presented in this report.

5.3 COLLECTION OF TRANSIT DATA

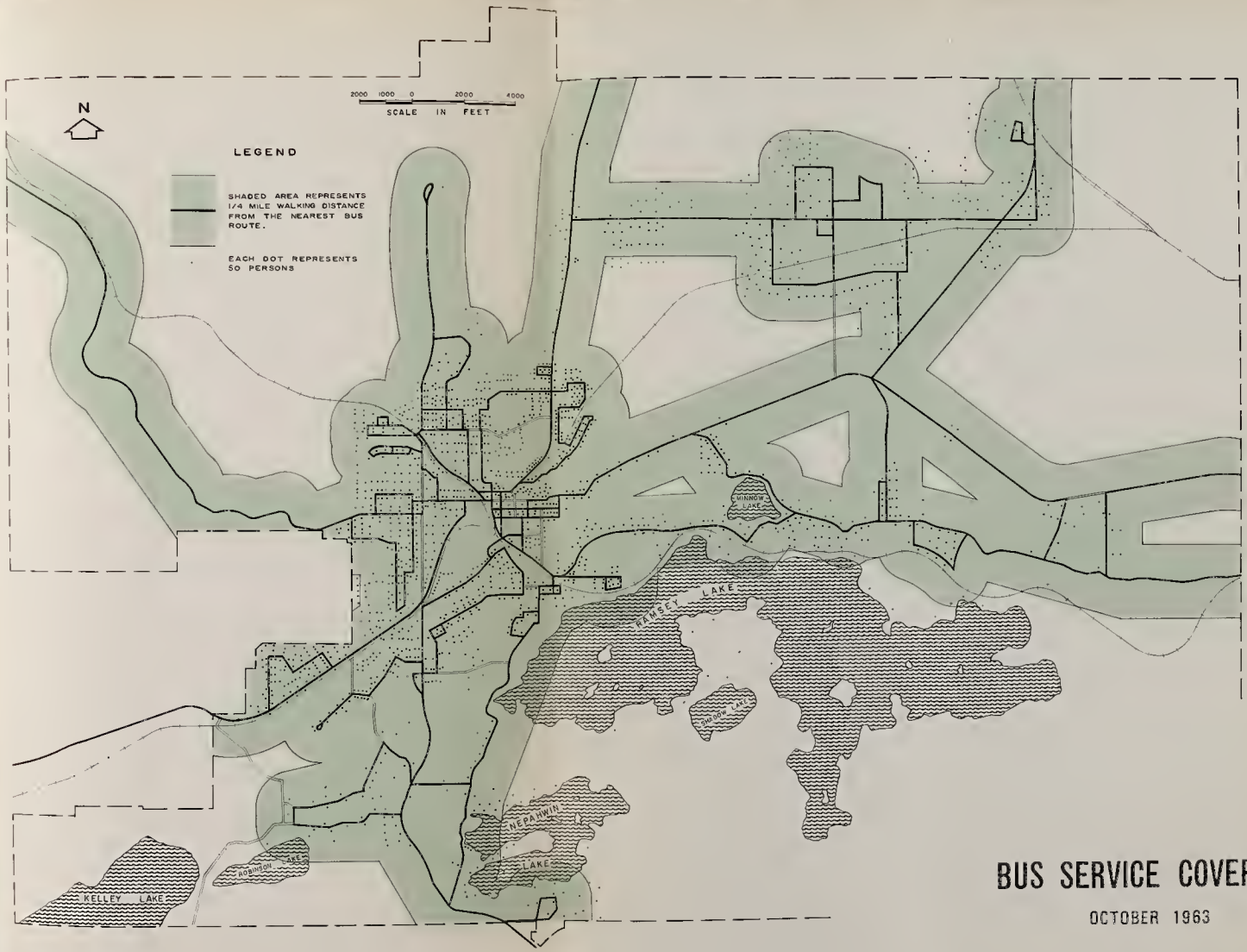
Management officials of the bus companies were contacted prior to the commencement of field studies. While all of those contacted expressed willingness to assist the study, the instability of operations at that time prevented them from furnishing pertinent operational data on passenger trends, or even up-to-date schedules of their services within the City. The bus route information supplied by at least one company had to be revised during the course of the field studies to reflect the almost constant adjustments to the services being provided.

The procedures used in the Home Interview survey are described in Section 2.4.1. This survey recorded household characteristics, together with origin and destination information on every trip made by each member of the household. The trips by automobile drivers are presented and discussed elsewhere in this report. The information on bus passenger trips has been used in the preparation of Exhibit 5.C (i) "Bus Trip Desires" as well as the various tabulations in Exhibit A.K.

The procedures used for the Transit loading and speed survey are described in Section 2.4.10, and the information collected by this method has been used in the compilation of Exhibits 5.A. 5.B(i), 5.B(ii), and 5.C(ii).

5.4 SERVICE AND COVERAGE BY BUS ROUTES

Exhibit 5.A shows bus services operating within the Sudbury City Limits in October 1963. The information is plotted on a population dot map, each dot representing 50 persons: the shaded area indicates the approximate proportion of the population living within 1/4 mile of a bus route (it is customary to assume that 1/4 mile represents a reasonable walking distance for the majority of persons). From these data, it has been calculated that bus routes serve 94% of the developed area of the City, and 97% of the residential population: obviously, bus routes operating at the time of the survey were giving remarkably good coverage to the City's residents.



BUS SERVICE COVERAGE

OCTOBER 1963

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT 5-A

The extensive public transportation service provided by the buses is even more commendable when it is remembered that topographical features of the area cause discontinuities in the street system, and therefore physical difficulties in establishing coherent bus routings: at the same time, development is quite sparse in some areas of the City, making them costly to serve. In this context it should be noted that both the extent of the area served and the level of service provided, are normally dependent upon economic considerations, and it is evident that these were distorted at the time of this study due to intense competition between the companies.

It is normal to compare the quality of transit service being provided at a given location with certain service standards recommended by authorities in the field. One such standard, the "Load Factor", is expressed as the ratio of the number of passengers carried to the number of seats provided and the recommended standard states that the load factor measured over a 30-minute period should not exceed 100% at off-peak periods or 150% at peak hours. Thus there would normally be an average of one seat per passenger in daytime hours and two seats for every three passengers at peak hours.

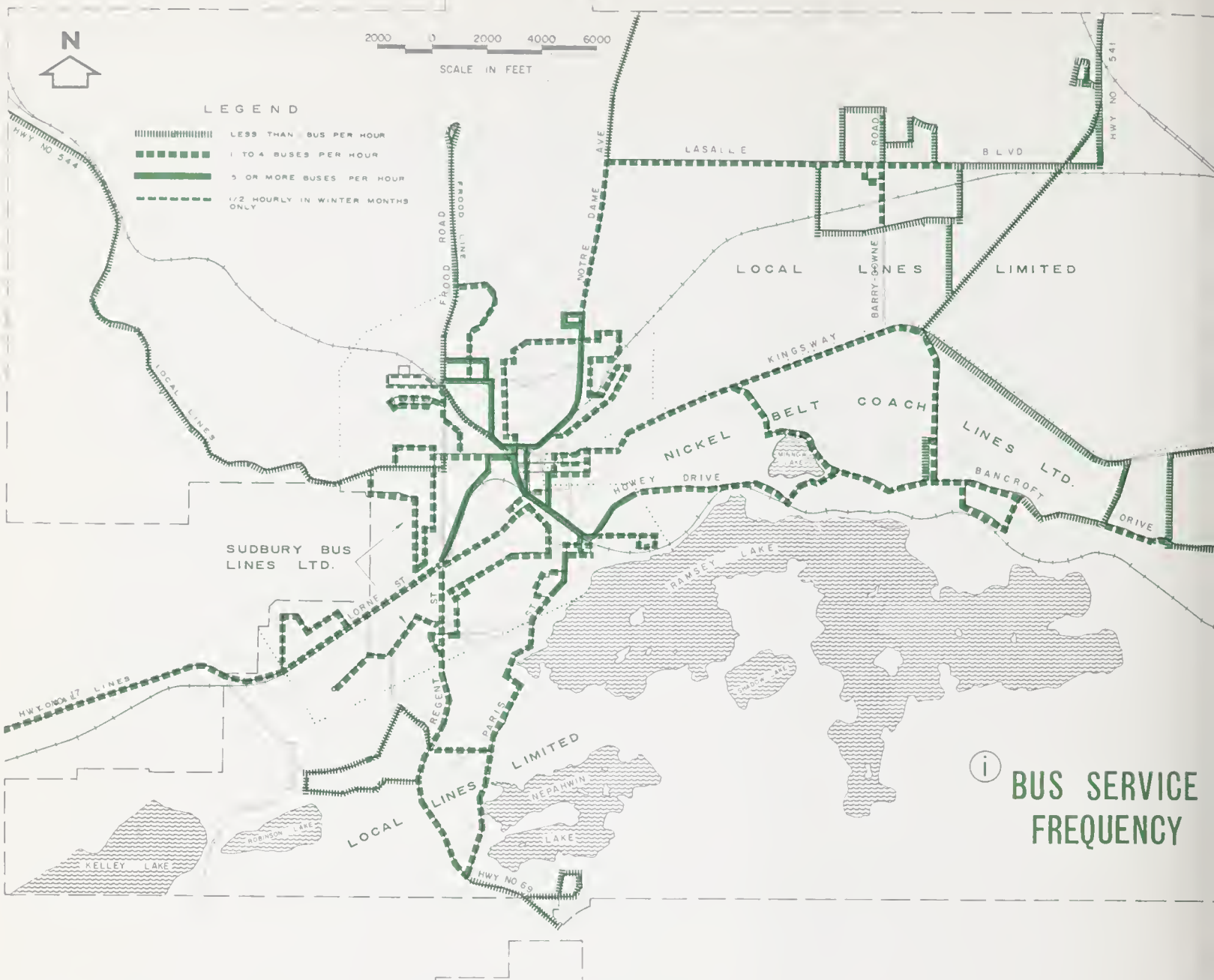
Although considerable effort was directed to the task of evaluating load factors for Sudbury's bus routes it proved to be an exercise of little value for two major reasons:

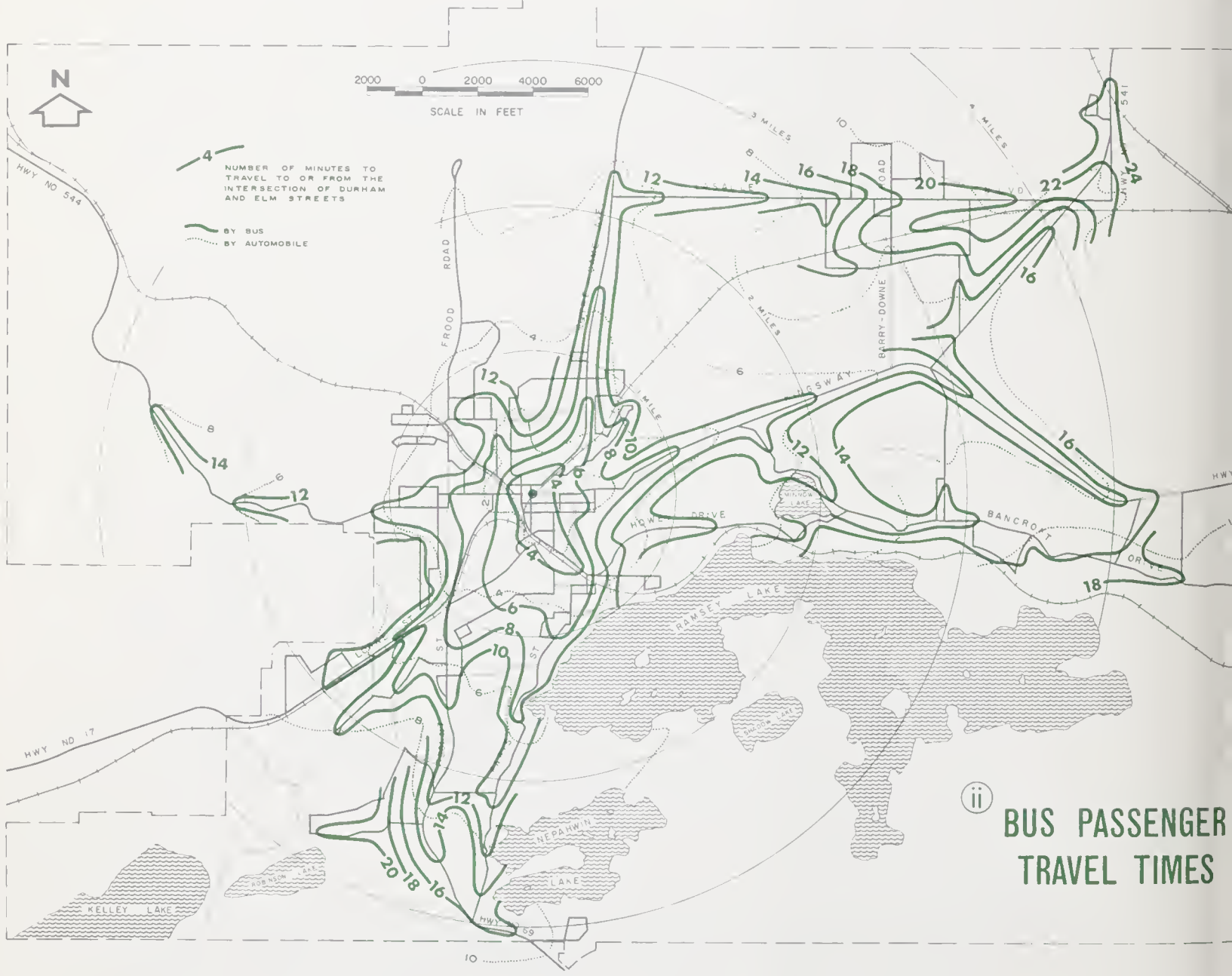
- the diversity of vehicles operated by the various companies made it impractical for the field staff to record aggregate seating capacity along a route.
- the duplication of routes by competing companies resulted in a great oversupply of seating capacity to the point where many vehicles carried only one or two passengers in off-peak periods.

A further measure of transit service, related to the load factor, is the frequency of buses along any given route. Average daily service frequencies for Sudbury's bus routes are presented in Exhibit 5.B(i). This indicates that most of the developed area is well served with hourly, half hourly or quarter hourly service, while parts of Lorne Street and Notre Dame Avenue have five or more buses per hour due to the overlap of routes. On some streets the service frequency is abnormally high due to the competitive efforts of different companies: this is particularly noticeable at various points east of Minnor Lake, where the density of development cannot adequately support the high frequency being provided. In areas where large volumes of passengers are generated, the frequency should be sufficient to ensure that the load factors mentioned above are not exceeded. Where passenger volumes are low, it becomes important to ensure that individual bus schedules are keyed to the specific work, school and shopping requirements of the passengers.

5.5 BUS TRAVEL TIMES

Exhibit 5.B (ii) shows the average time required to travel by bus from the intersection of Durham and Elm Streets to all points within the City. For purposes of comparison, the travel times of automobile drivers (extracted from Exhibit 3.F (ii)) have been superimposed. While certain minor distortions occur in





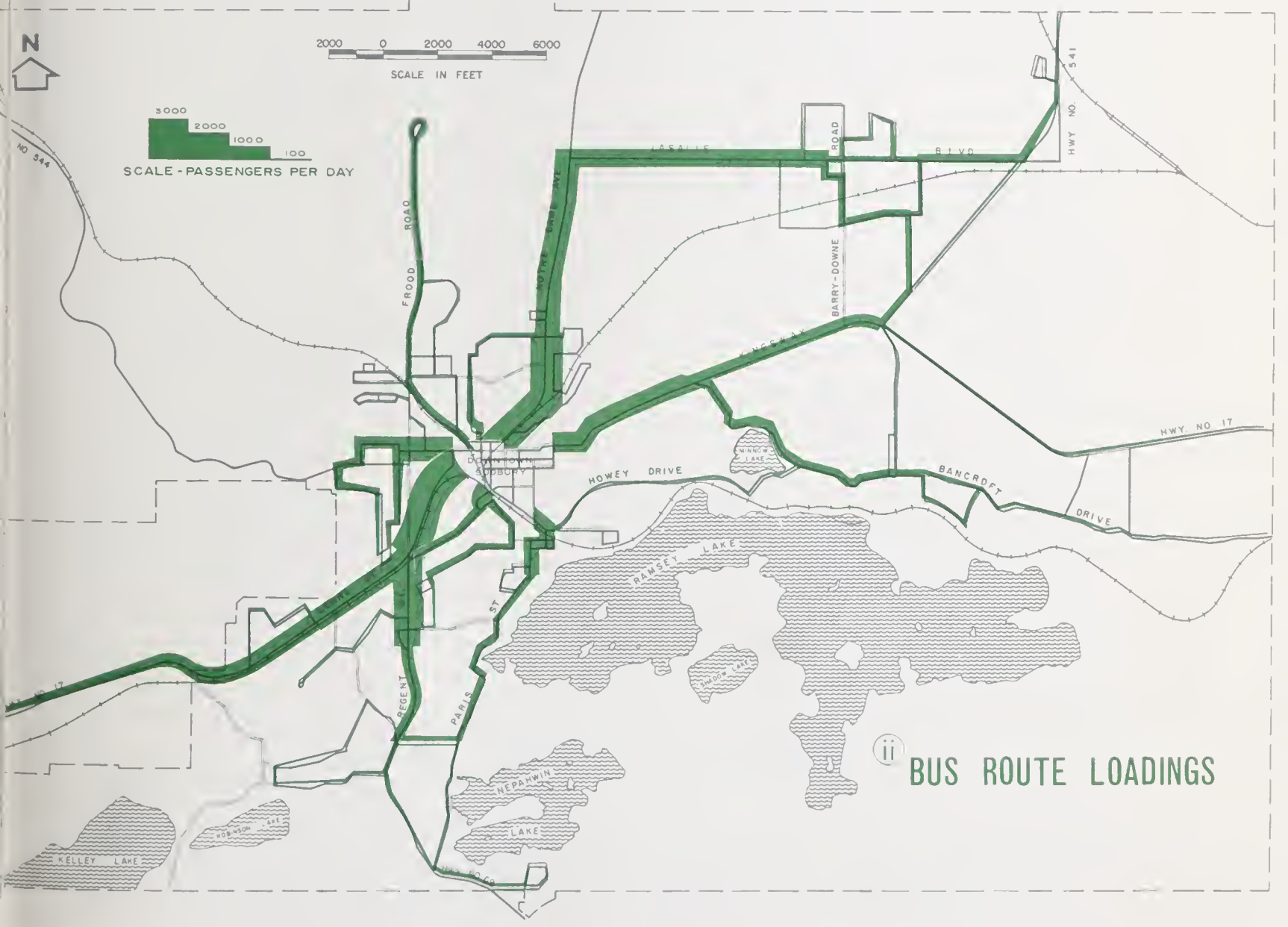
SUDBURY AREA TRANSPORTATION STUDY

TRANSIT STUDIES

OCTOBER 1963

DILLON

EXHIBIT



SUDBURY AREA TRANSPORTATION STUDY

TRANSIT STUDIES

OCTOBER 1963

DILLON

this presentation due to the different locations of various bus terminals, it is readily apparent that for many journeys, bus travel times are DOUBLE the corresponding automobile travel times. For example: the trip from downtown Sudbury to the New Sudbury Shopping Centre (Barrydowne/La Salle) takes approximately 18 minutes, while the same trip by automobile takes only 9 minutes. For trips to points a little removed from the bus routes the differences are greater because of the walking times involved, and further penalties are applied to bus travel times when some allowance for passenger waiting time is added to these figures.

From these results, it is clear that there is no real competition between bus services and automobile travel. The automobile is speedier and more convenient and will be the chosen method of travel for anyone to whom it is readily available. There are several factors which may affect this choice to a minor extent (the availability and cost of parking facilities will probably be a consideration),but other studies have shown that the time differential is likely to be the most important determinant for the individual traveler.

These effects should be borne in mind when modifying existing bus services or planning future services. The time differential can be diminished by providing efficiently designed, well-located passenger loading facilities, and express services to the more distant areas. The ideal facility would take the form of an exclusive transit right-of-way, where frictions and interference among travel modes and individual vehicles would be virtually eliminated. In general, however, buses would not be expected to equal the speeds of private automobiles. The work of various authorities indicates that overall operating speeds of an efficiently designed and operated transit system can approach 70 or even 80 per cent of automobile speeds.

5.6 BUS PASSENGER TRAVEL DESIRES AND ROUTE VOLUMES

Exhibit 5.C shows the travel desires of bus passengers and the approximate daily route volumes resulting from bus trips. Both of these may be compared with equivalent information for the private automobile mode, presented elsewhere in this report: such a comparison clearly indicates underlying differences in the two types of travel. These differences stem from the basically divergent requirements and destinations of persons served by the two modes, and although it is sometimes thought that buses compete with the automobile for passengers, deeper consideration reveals that they are not truly alternatives, for each mode fulfills a necessary role with respect to overall urban transportation.

Analysis of the home interview data supports observations from elsewhere to the effect that bus patrons represent three important groups of people:

- those who do not have access to an automobile, either because the household does not own one or because the individual concerned does not drive. Older or disabled citizens, wives and mothers who do not drive or whose husbands consistently use the family car in their daily work, and young adults unable to make the required investment in

a car, largely constitute this group
- school children, particularly those attending secondary schools at some distance from their homes.
- persons destined for the highly developed core of the city, where the frequency of bus service and the expense of parking an automobile make the bus the more attractive mode of travel.

The journeys of all the above groups tend to converge upon the downtown area of the City either for work, school or shopping purposes, and hence, it is no surprise to observe that the greatest concentration of bus trips occurs in and around the downtown area.

It cannot be too strongly emphasized that these groups of people and their associated travel needs represent absolutely essential elements of the traffic pattern throughout the city. Admittedly, the volume of trips thus represented is but a small component within the overall transportation picture, and it may also be suggested that eduction authorities can and do take responsibility for many student trips by means of special school buses. Nevertheless, there remains the vital job of providing public transportation for that quite substantial group of citizens who remain wholly dependent upon it.

5.7 THE POSSIBLE EFFECT OF ELIMINATING BUSES

It has been stated above that the most marked effect of bus service upon personal travel is noted in and around the downtown area. In order to illustrate this, portions of the cordon classification counts taken around the downtown area have been extracted as follows:

- In the morning peak hour (8:00 - 9:00 a.m.) 1,668 inbound bus passengers crossed the cordon line in 92 buses, giving an average occupancy of 18 passengers per bus.
- In the evening peak period (4:00 - 6:00 p.m.) 3,365 outbound bus passengers crossed the cordon in 153 buses giving an average occupancy of 22 passengers per bus.

If the 3,365 persons leaving the C.B.D. in the evening peak period had to be carried in automobiles at an average occupancy of 2 persons per vehicle, (the average occupancy in 1963) some 1,700 vehicles over and above existing volumes would have to be accommodated. Using figures presented elsewhere in this report (1,000 vehicles/11' lane/hour, and 50% green signal time), some four outbound traffic lanes would be required to handle the additional volume. Thus, the withdrawal of bus service, as operated in 1963, would result in an immediate additional demand for one 8-lane or two 4-lane roads, in order to provide equivalent SINGLE MODE service to the downtown area, not to mention increased requirements for downtown parking facilities.

It is clear that the provision of public transportation is vital to the purposes and operational requirements of the Central Business District. Elimination of bus service would disrupt the travel patterns of several thousand people, and cause a serious physical capacity problem on the street system in and around downtown.

5.8 CONCLUSIONS OF THE TRANSIT STUDY

Data for the transit study were collected at a time when the bus system was operating in an unstable manner. While the information on passenger trip desires is reliable within the limits of accuracy of the home interview survey, the data concerning bus routes and services may be subject to later revision.

Although the citizens of Sudbury were enjoying a high level of service in October 1963, this situation is unlikely to continue. Over the longer period, no City can be properly served by a fragmented public transportation system and Sudbury will need to exercise a greater measure of control if it is to obtain full value from its transit facilities.

It is recommended that the City set up a Public Transportation Committee or a Transit Commission to study the bus services of the area and develop policies to guide, regulate and coordinate the provision of public transportation according to the requirements of the City.

The development of a unified and integrated system will contribute to the ultimate benefit of all citizens of Sudbury. The development of a city-wide system will automatically eliminate conflicting route layouts, and operating idiosyncrasies presently existing, and permit rationalization and coordination of routes, schedules and fare structures. At the same time it is to be hoped that means will be found to retain the valuable features attributable to the present operations: in particular, the overlapping of express routes (of Local Lines Limited) with the local routes (of Sudbury Bus Lines Limited) appears to be a feature worthy of preservation wherever feasible.

In addition to the general conclusion that Sudbury's bus system requires overall coordination and control, several further suggestions arise from the analysis of transit data as follows:

- Certain individual routes are very lightly traveled. These should be eliminated or consolidated with adjacent services.
- Some services contain one-way loops through residential areas. It would be desirable to make all services two directional by dispatching alternate buses in either direction (e.g. similar to route no. 4 "Pine" and "Eyre" buses of Sudbury Bus Lines Limited).
- The possibility of serving major industrial areas with "part time" or "rush hour" services should be further investigated.
- The possibility of establishing a unified system of local and express services should be examined. "Local" services would constitute most routes currently operated by Sudbury Bus Lines Limited plus New Sudbury services of Local Lines Limited and the Minnow Lake and Bancroft/Coniston services of Nickel Belt Coach Lines Limited. "Express" services would constitute all current Local Lines Limited routes extending beyond the City Limits, as well as the Highway 17/Coniston service of Nickel Belt Coach Lines Limited. Such a two-level system of operation would require

strategically-located transfer points between "express" and "local" services. Outlying transfer points and other convenient locations could be used as fare zone limits, depending upon the fare structure established for the entire service area.

- A new bus terminal might be established in downtown Sudbury to accommodate all major "express" and "local" bus services. Since virtually all routes converge on the Central Business District, the opportunity exists to develop a consolidated transportation terminal, perhaps integrated with prestige high-rise office and merchandising facilities: such high-density developments would in themselves generate a demand for public transit service. The new terminal could most logically be located within the area bounded by Elm, Elgin, Larch and Lisgar Streets.
- In recognition of the problems involved in bringing ever-increasing numbers of people into the downtown core, and in parking ever-increasing number of shoppers' and employees' cars, the City, the merchants and the employers concerned might well find it worthwhile to embark upon a promotional campaign which would demonstrate the value and convenience of buses as a means of travel into and out of the Central Business District. With respect to parking lot operation, the Sudbury Parking Authority has already entered into arrangements with merchants and private parking lot operators for the use of parking stamps, which represent some degree of parking facility subsidization. Would it not also be logical for promotional efforts along these lines to be directed toward greater usage of the bus system!

5.9 THE FUTURE OF PUBLIC TRANSPORTATION IN SUDBURY

The transit study was not designed to provide a framework for future transit operations in Sudbury, but it is quite evident from a general review of the existing (1963) situation that regulation and coordination of services is the primary requirement. Control of the public transportation system must be exercised within a framework of a series of policy decisions which define the public interest in the subject, and City Council has given considerable study to the matter over the past few years. In July 1965, the City publicly advertised for proposals to operate a unified bus system under a franchise agreement.

Considerable useful data on transit travel has been assembled during the present study. The origin and destination information, in particular, will provide a substantial background against which route modifications and new route proposals may be evaluated. The household data will provide considerable information on the social and economic status of the present and potential bus passengers. All the available data will be deposited with the City for their reference and further analysis.

The volumes of person-trips which will be served by the transit system in the future are a matter of some conjecture; they will depend to a considerable degree upon the future extent of the system and upon the service offered. The growth of Sudbury, the

increase in population, the development of new residential and industrial areas and the redevelopment of the downtown core will all affect the demand for public transportation facilities.

Experience in other cities indicates that buses will probably continue to lose some passengers to the private automobile. However, with competent and imaginative management, the losses will be minimized and an efficient service maintained for that important segment of the population to whom such service is essential.

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EXHIBIT	*DESCRIPTION*	
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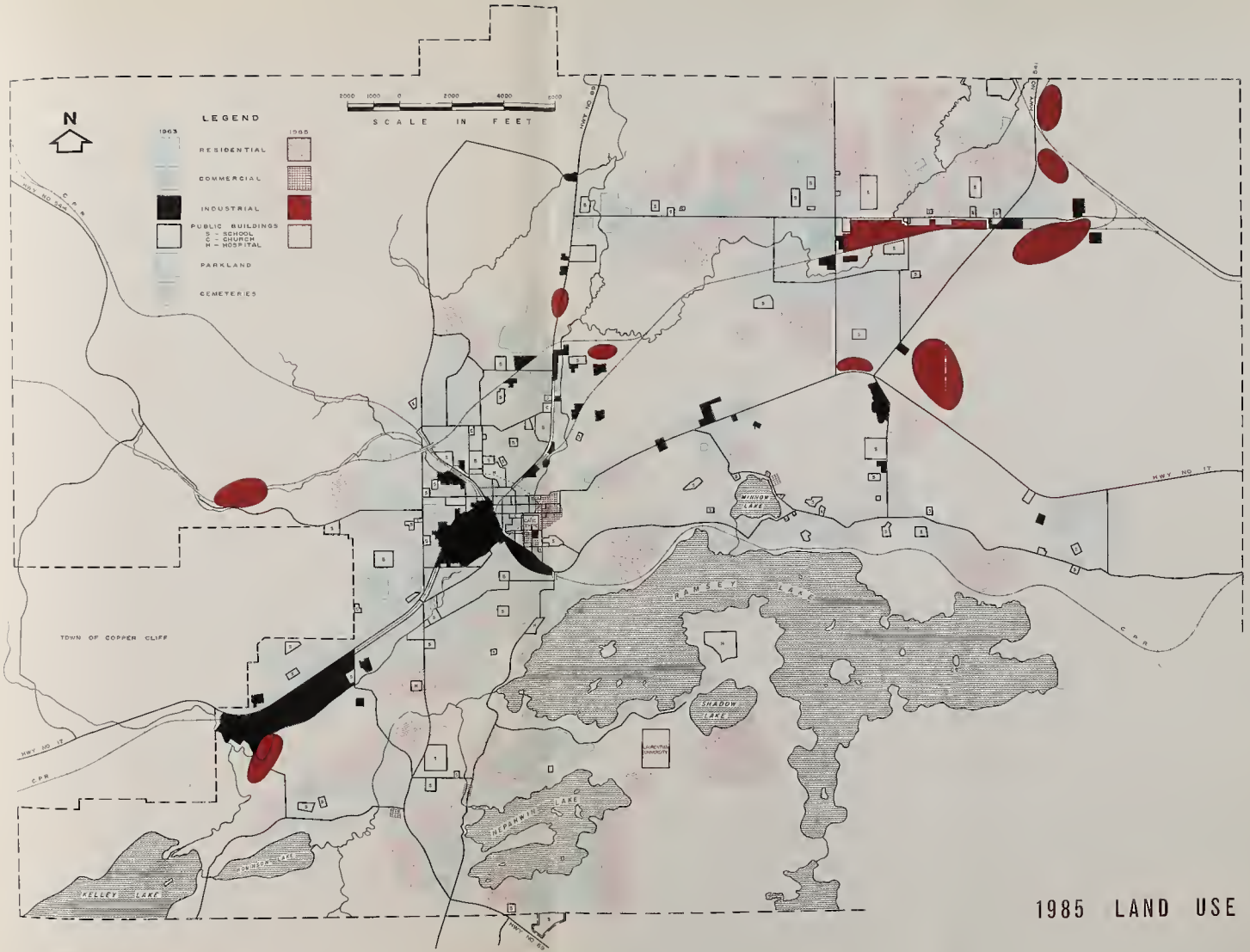
6.H	*ASSIGNMENT OF 1985 TRIPS TO THE EXISTING STREET SYSTEM*	*following Page 72*



1985 LAND USE

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT 6-A

CHAPTER 6

PROJECTION OF 1985 TRAFFIC

6.1 OBJECTIVES OF THE PROJECTION TECHNIQUE

Major objectives of the transportation study, as specified by the Terms of Reference, are the formulation of a major road and street plan and the presentation of a construction programme designed to meet the projected future needs of the City of Sudbury. The existing traffic conditions were surveyed as discussed in Chapter 3, and some of the existing needs of the street system have been indicated by this work. In this and following chapters of the report, data on existing travel patterns will be projected to show the nature and size of future traffic demands, and the effects of future traffic volumes will be evaluated according to agreed standards of street service.

Exhibit 1.D has indicated the anticipated growth in Sudbury's population during the 20 year period to 1985, and the projected increases in vehicle ownership and travel mileage associated with this population growth. The Sudbury Planning Board has devoted considerable study to the population projections and to the many other factors which will affect the future development of the area. Their projections of land use and floor space are represented by the 1985 Land Use Plan (Exhibit 6.A) and the zone-by-zone tabulations in Exhibit A.E. These data indicate that the population is expected to increase from some 81,000 persons (1963) to approximately 118,000 persons in 1985. Some infilling of existing residential areas will occur, but additional residential development will take place in New Sudbury, in areas east of Minnow Lake and around the Laurentian University. Industrial employment in the City is expected to increase from less than 6,000 jobs to more than 15,000, and new industrial development will take place eastward and westward from existing developed areas. In the same period, expansion and consolidation of commercial areas will occur and the floor space in the downtown area is expected to grow from 2.7 million square feet to 6.4 million square feet.

In order to translate the land use projections into estimates of future traffic, a relationship must be established between them, and the key to this process is provided by the data on travel patterns derived from the origin-destination surveys (Home Interview Survey, External Cordon Roadside Interviews and Truck/Taxi Reports). For the purposes of this study a direct relationship was obtained between travel desires and reported land uses. Thereafter traffic projections were made by application of the land use growth factors to the data on existing trip patterns.

Having estimated the volume of future travel and the distribution of trips throughout the city, a relatively straight-forward computer technique was used to determine the traffic demands on each route in the street network.

6.2 EXPANSION VALIDATION AND ADJUSTMENT OF O-D INTERVIEW DATA

The procedures used to examine the interview data and prepare it for projection are explained in some detail in Section A.2 of the Appendix, and this work forms the basis for the 1963 Trip Tables (Exhibit A.D).

6.3 INVESTIGATION OF TRIP CHARACTERISTICS

A considerable amount of analysis work was devoted to identifying of the underlying motivations which affect the generation and dispersal of person and vehicle-trips throughout the urban area. Some relevant material is presented in Section A.3 of the Appendix, and further data was obtained from a series of tabulations derived from the punched cards representing the trip interviews. This work provided an understanding of the trip patterns in Sudbury and established criteria for the process of projecting the 1985 traffic volumes.

6.4 PROJECTION OF 1985 VEHICLE TRIPS

The procedure used for projection of the 1985 vehicle trips is described in greater length in Section A.4 of the Appendix, and the results of this process are presented in Exhibits A.E and A.F.

In 1963, a total of more than 124,000 trips occurred daily in the City of Sudbury, and the projections indicate that nearly twice this number (246,600) may be expected to occur on a typical weekday by the year 1985.

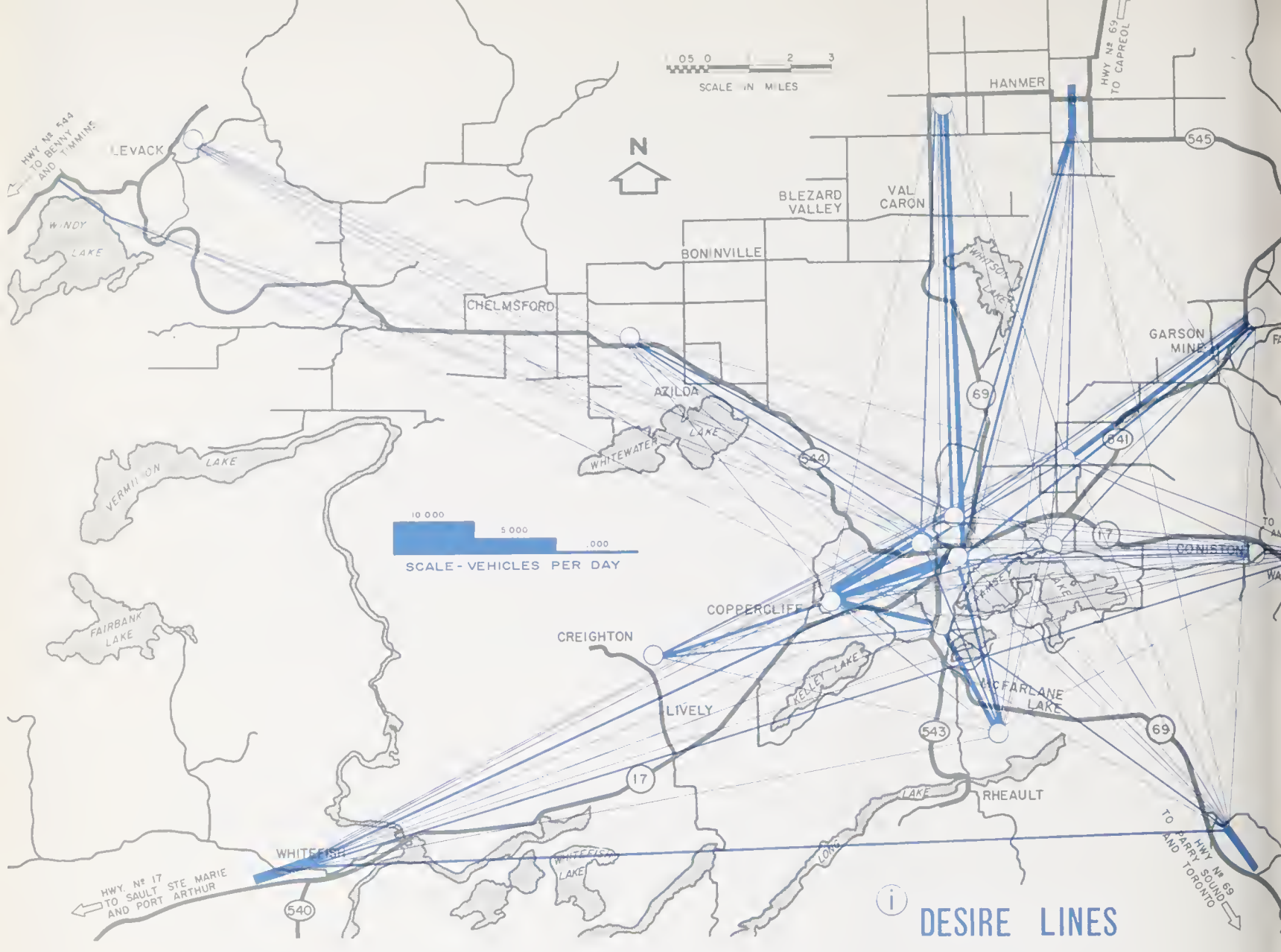
Internal trips will increase from 89,000 to 187,000 per day over the 20 year period. Internal/External and External/Internal trips (i.e. those having one terminus inside the City of Sudbury) will increase from 30,600 to 51,600 per day and External/External (through) trips will increase from 4,100 to 8,100 per day over the same period.

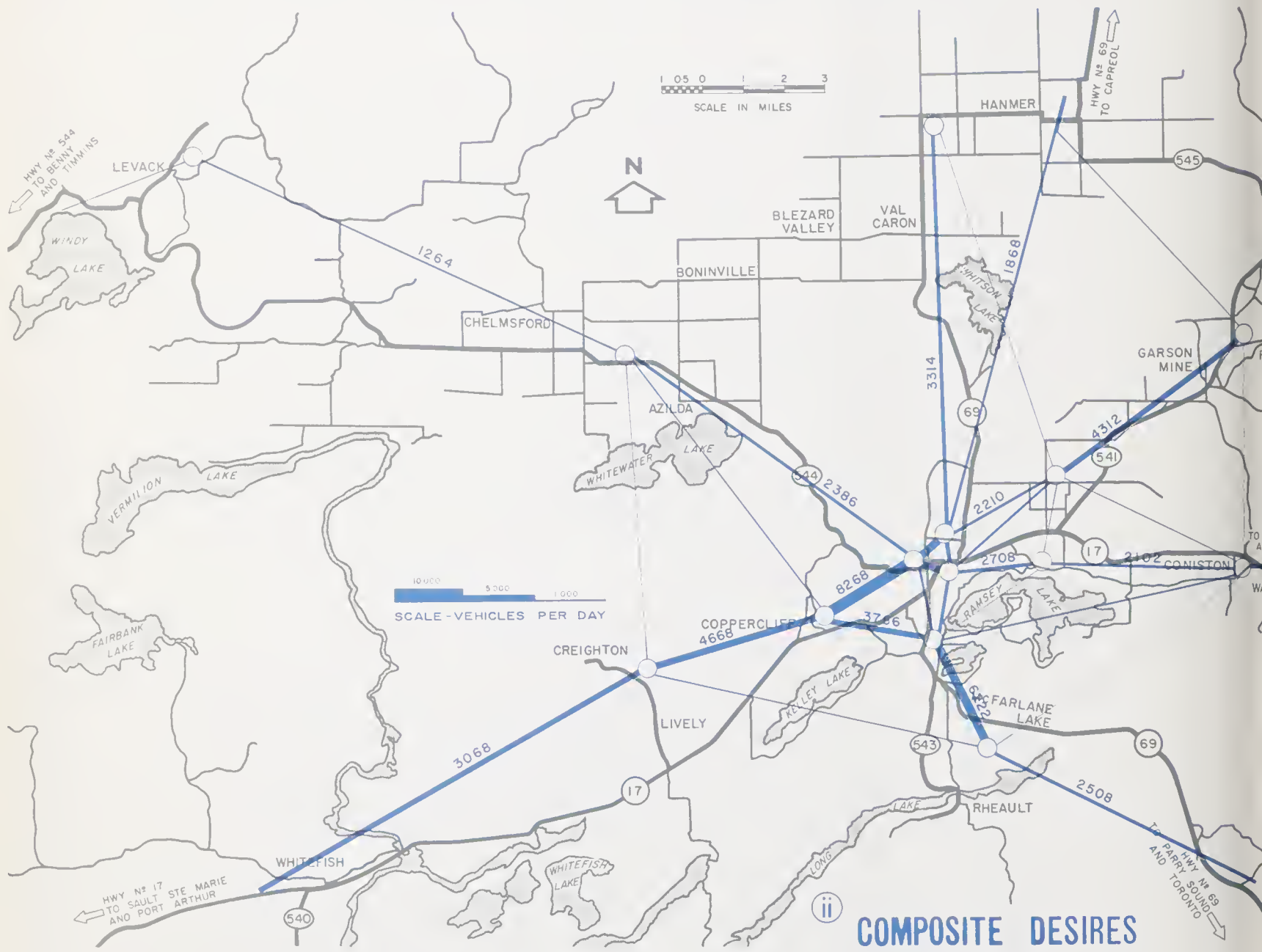
Probably the most significant result of these projections is the indication that growth of downtown floor space will produce an increase in the number of trips destined into the Central Business District from 22,100 (1963) to 54,400 per day (1985). Such a substantial increase in traffic volume will generate design and operational problems in and around the central area, where possibilities of physical improvement are already severely limited by natural (topographic) features and the barrier effect of the railway facilities.

6.5 PRESENT AND FUTURE TRAVEL IN THE REGION

Exhibits 6.B and 6.C represent 1963 and 1985 trips respectively. The 1963 desire lines and composite desire lines show trips interviewed at the external cordon, and exclude the internal trips obtained from the Home Interview Survey. The 1985 exhibit shows the effect of applying calculated growth factors to 1963 trips.

Comparison of these two exhibits shows that trips following Highway No. 544 northward are expected to increase substantially. The construction of a new highway link with Timmins will engender new traffic in the Sudbury area which is not represented

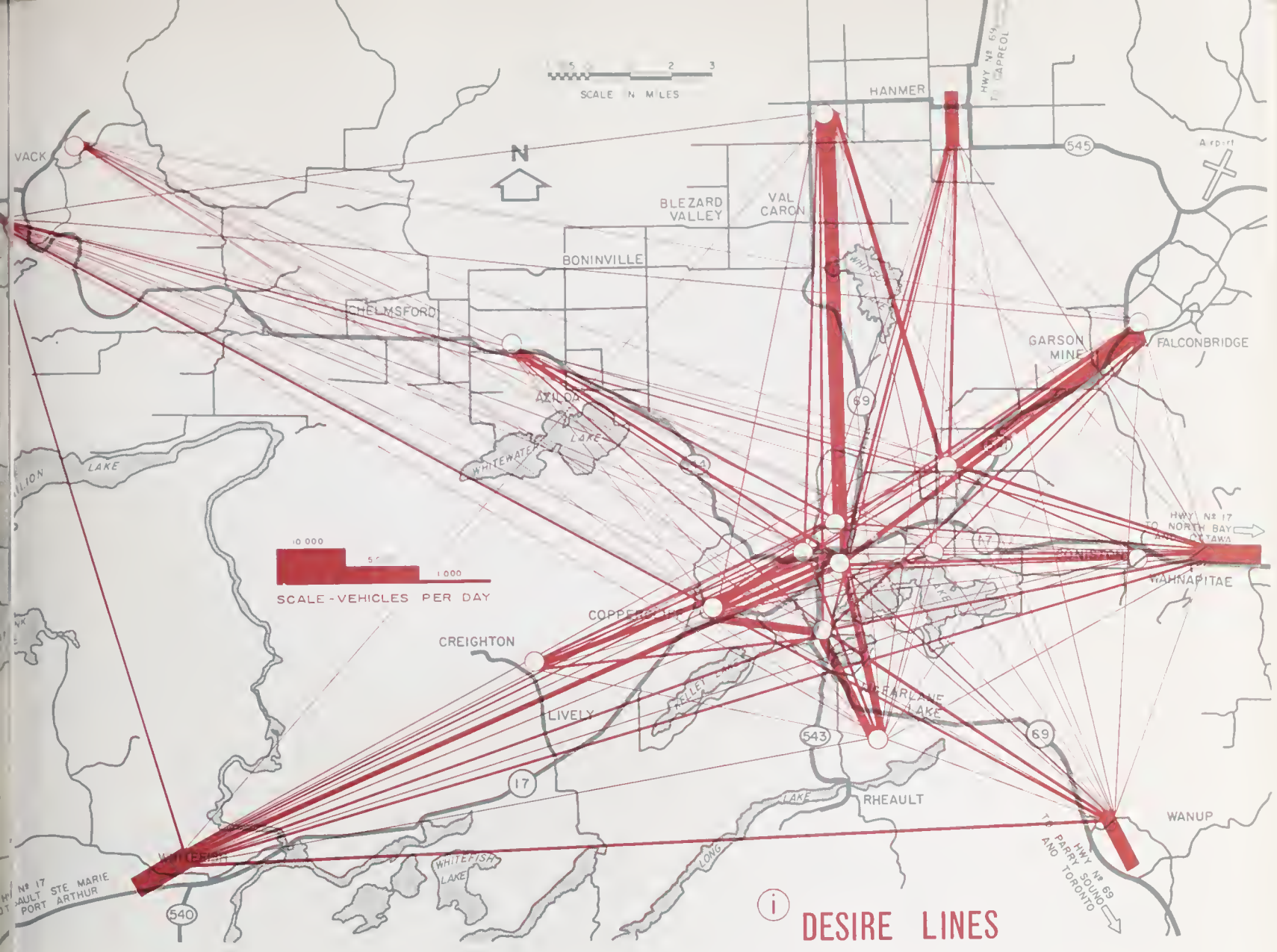


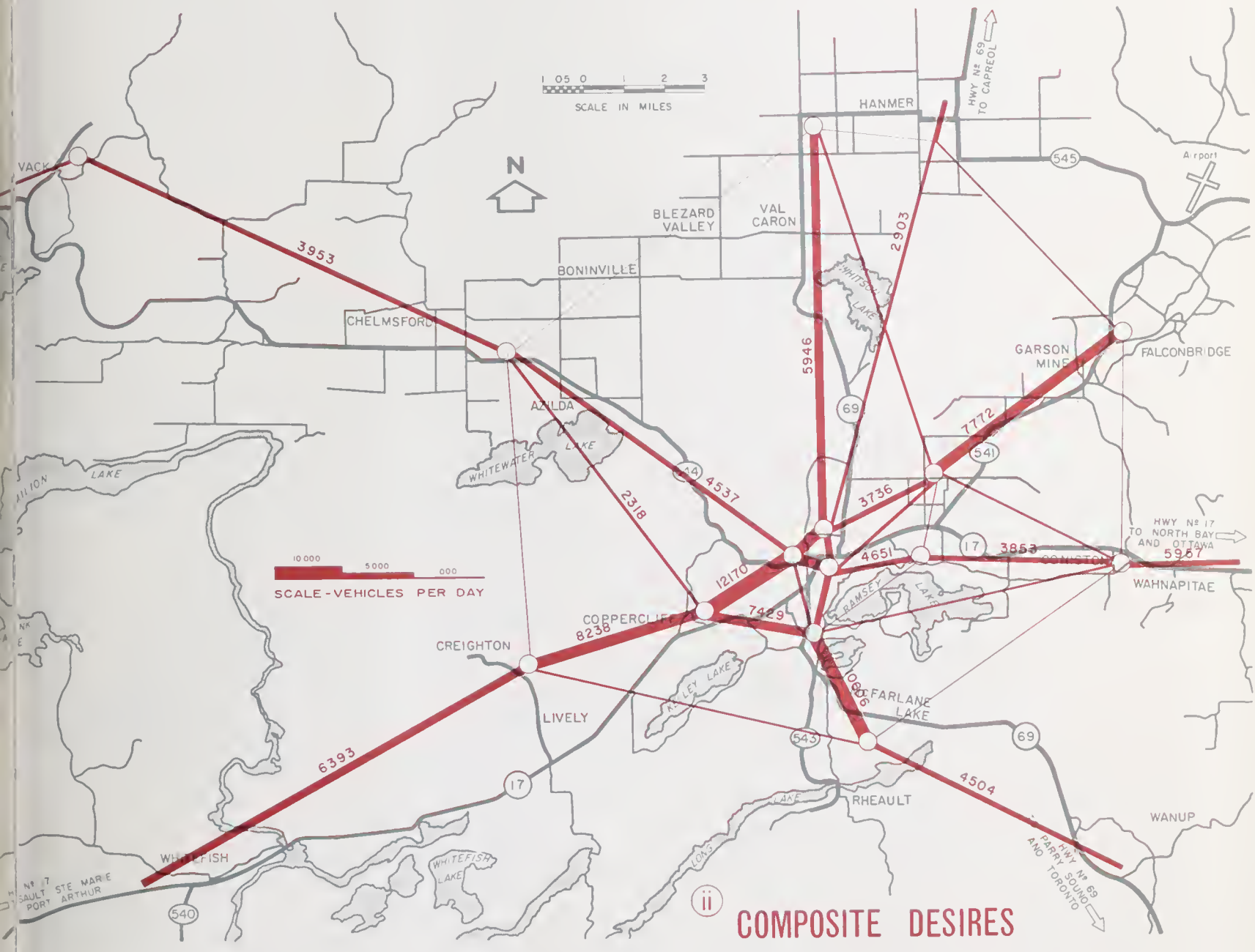


SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT





SUDBURY AREA TRANSPORTATION STUDY

EXTERNAL and EXTERNAL - INTERNAL TRIPS

FOR 19 REGIONAL AREAS

DILLON

by any existing movement. Certain assumptions as to the probable distribution of traffic assigned to the new Timmins Highway are implicit in the 1985 desire line presentation.

The location of the external cordon with respect to the highway network is such that the only trips occurring within the region and NOT intercepted for interview would be those passing through the Blezard Valley corridor, (say) between Azilda and Hanmer or Val Caron and the Garson/Falconbridge area.

On the assumption that most of the important traffic movements in the area were observed and analyzed within the context of the Transportation Study, the general conclusion to be drawn from the desire lines is that there are very few existing or projected traffic movements in the area which would benefit from a large-scale system of bypasses beyond the boundaries of the present City.

As stated elsewhere in the report, most of the highways radiate from the centre of Sudbury, and major highway routes are generally closely aligned with major travel desires. From the diagrams, the heaviest circumferential movement appears to be that between Highway 69 South and Highway 17 West. This would represent mainly work trips between the Lockerby district and the Town of Copper Cliff. Suggestions have been made to bypass Sudbury on the west and south with new roads connecting Highway 544, Highway 17 and Highway 69. While these would probably represent the most useful of any bypass contemplated, such a route would have to provide good connections with the Town of Copper Cliff before any substantial traffic volumes could be attracted.

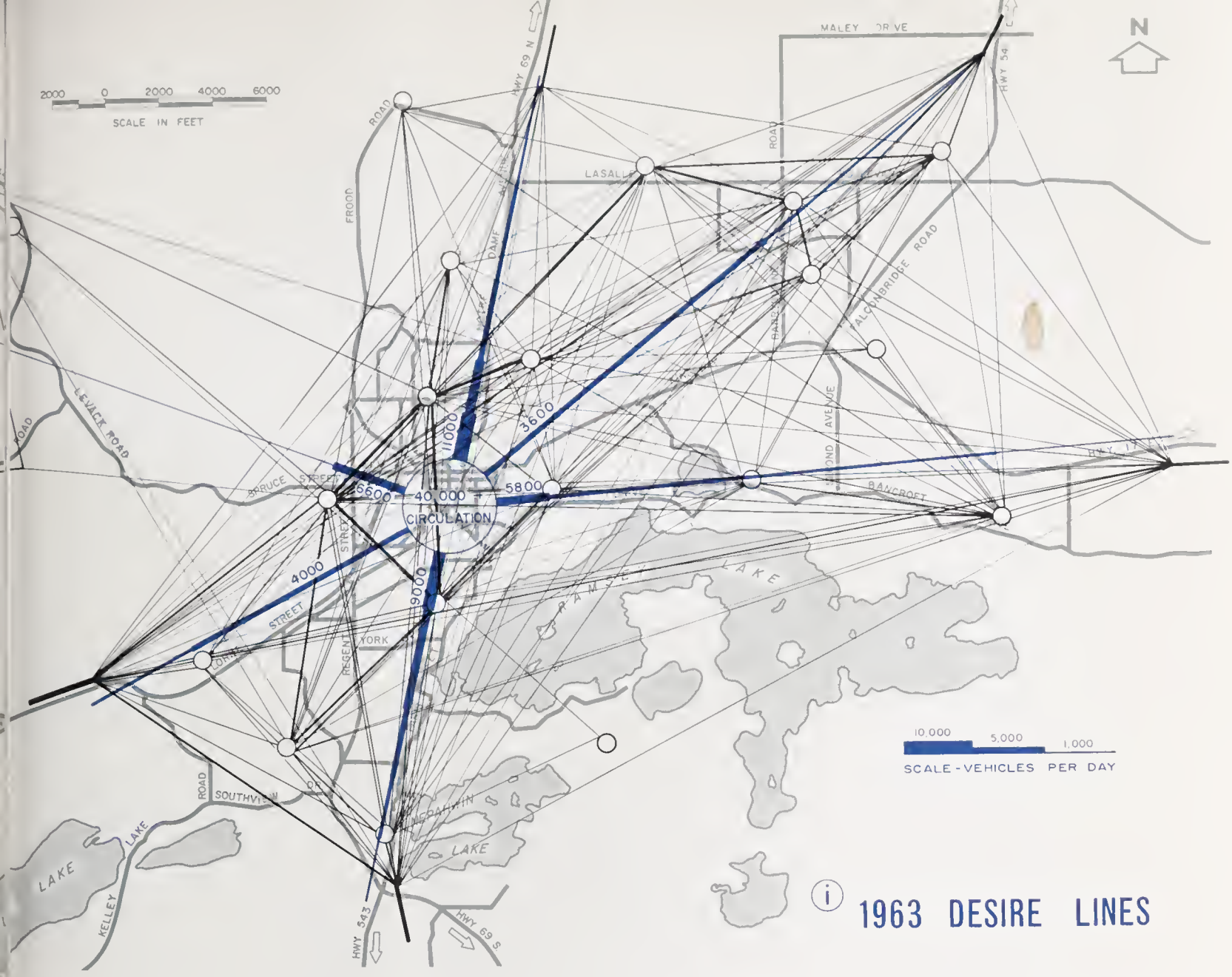
6.6 PRESENT AND FUTURE TRAVEL WITHIN THE CITY

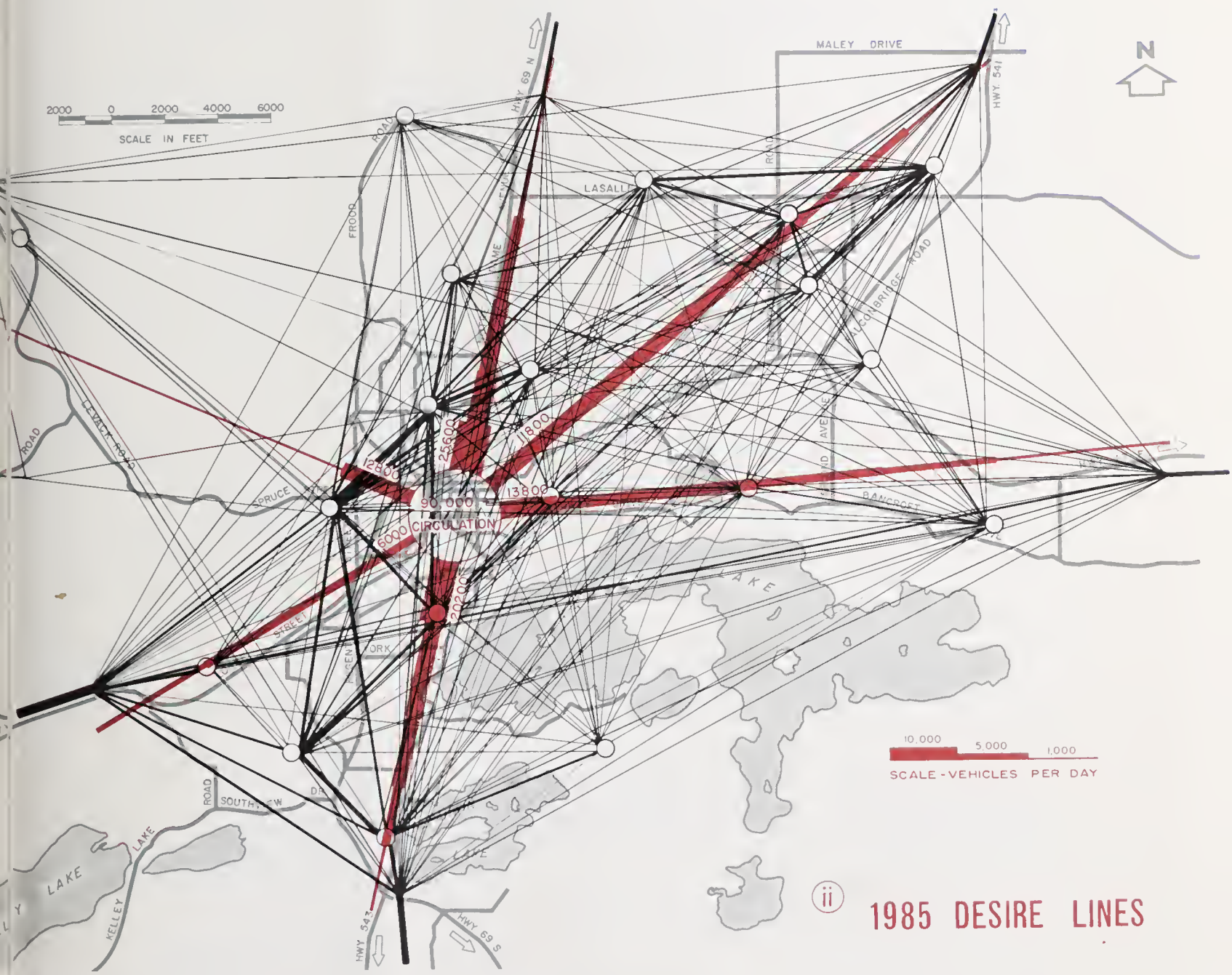
Exhibit 6.D shows 1963 and 1985 desire lines. For the purpose of this presentation, the districts comprising the downtown area have been combined, and trips to and from downtown have been consolidated along the six major approach corridors.

Each of these diagrams shows the marked concentration of trips along a generally S.W. - N.E. axis, and the comparative scarcity of trips in the N.W. quadrant (due to irregular, barren terrain and meagre development) and in the S.E. quadrant (due to Lake Ramsey).

The most significant factor indicated by the two desire line diagrams presented here is the substantial expansion in trips to and from downtown. The reason for this very large projected increase is the anticipated growth in downtown retail and office floor space from the existing 2.7 million square feet to 6.4 million square feet in 1985. This is expected to result in an increase of trips to downtown destinations from 22,100 to 54,400 inbound (one way) movements. Although these volumes include some intra-downtown trips, it is likely that the "to and from" movements generated by the C.B.D. will increase from 40,000 to 90,000 (two way) trips per day by 1985.

Furthermore, in addition to those movements associated with the commercial attractiveness of downtown, there is considerable THROUGH traffic to be accommodated, due to the effect of the radial route network centering upon the C.B.D.





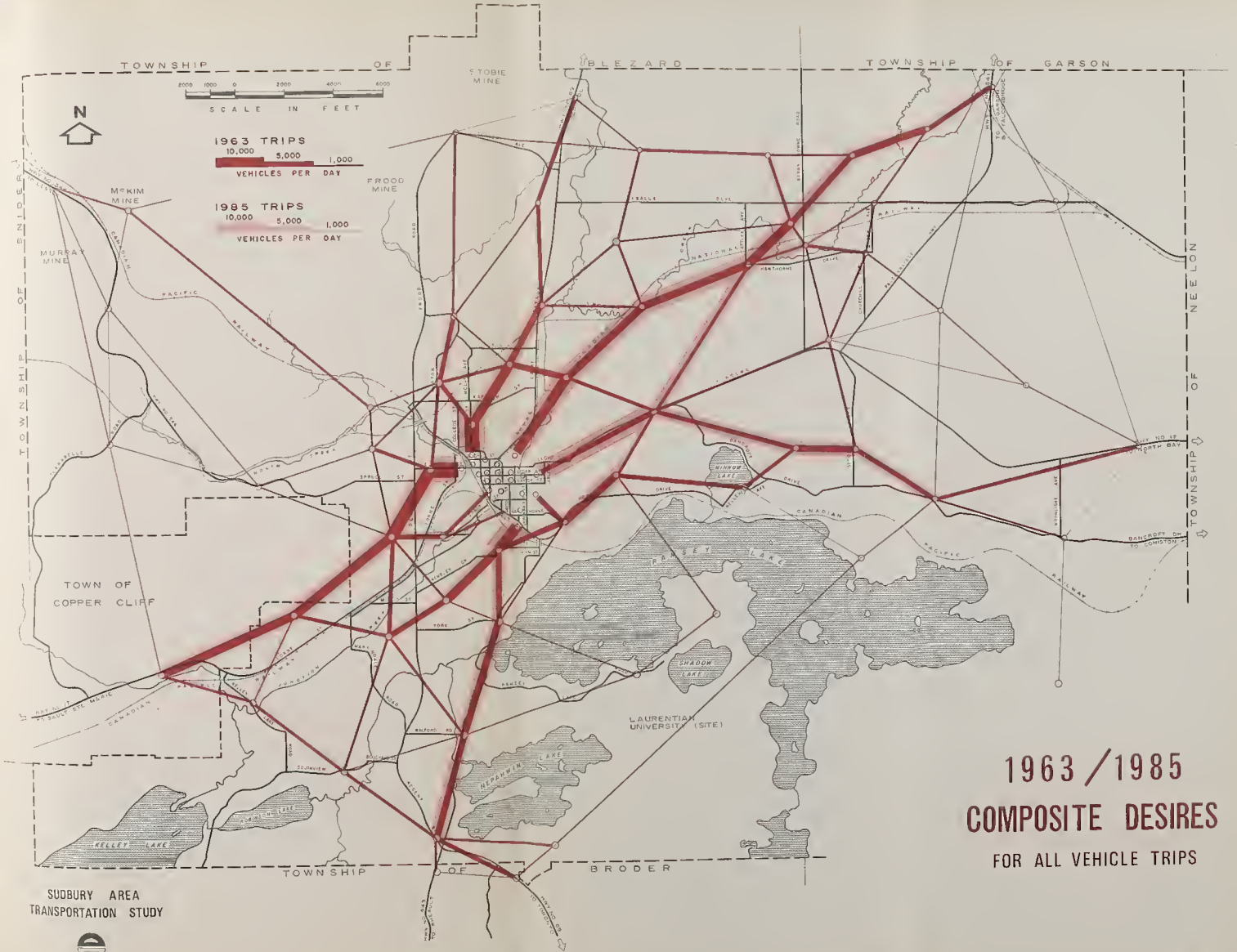
SUDBURY AREA TRANSPORTATION STUDY

DESIRE LINES

FOR ALL VEHICLE TRIPS

DILLON

EXHIBIT 6·D



1963/1985 COMPOSITE DESIRES

FOR ALL VEHICLE TRIPS

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT 6-E

Discussion put forward earlier in this report has drawn attention to the rather burdensome pressure of traffic in the downtown area, and the desire lines presented in Exhibit 6.D indicate that a great intensification of this pressure may be anticipated between 1963 and 1985.

Exhibit 6.E shows 1963 composite desire lines and 1985 composite desire lines superimposed. The general pattern of S.W. - N.E. movements is quite clearly indicated by this diagram, and the growth of trip volumes can be gauged by comparing the 1963 and 1985 components. As expected from the land use projections, some of the most substantial growth is evident in the New Sudbury area of the City. Once again, however, it must be noted that the most significant volume increases are expected to occur in and around the downtown area, attributable to the substantial growth of the C.B.D. itself, in combination with the growth in S.W. - N.E. movements crossing downtown.

6.7 PRESENT AND FUTURE TRAVEL IN THE CENTRAL AREA

From composite desire line diagrams based upon the 83-zone trip table, the central area has been extracted and redrawn at an enlarged scale for more detailed analysis. Also, the trip table has been separated into two sections.

(i) containing all trips having either origin or destination in the downtown area, and

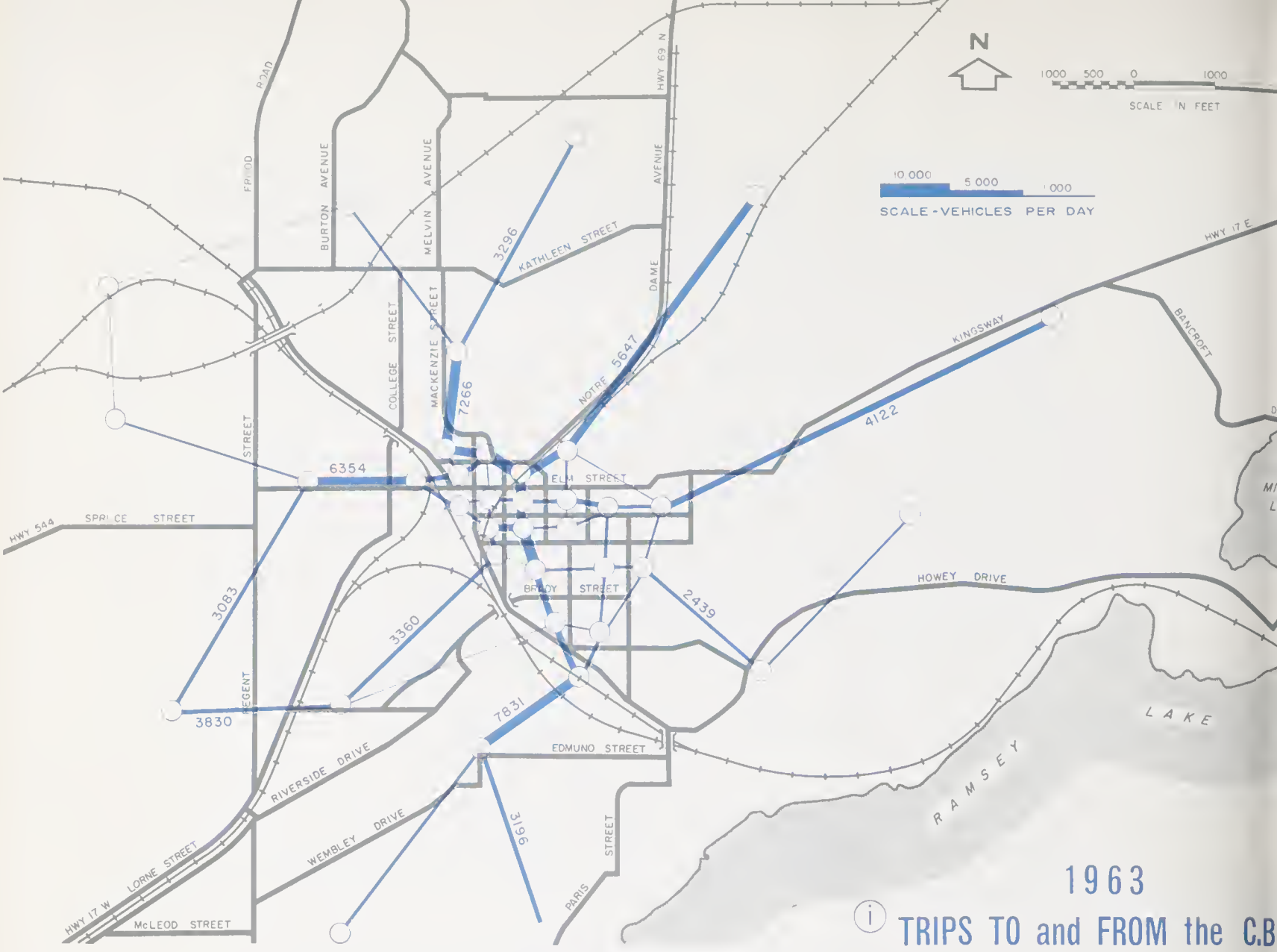
(ii) containing all other trips occurring in the City.

Exhibits 6.F and 6.G show the results of these analyses.

Comparing Exhibits 6.F and 6.G gives some idea of the increased trip volumes which must be accommodated in the coming 20 years.

Referring to Exhibit 6.G (i), traffic is seen to converge upon the downtown area from five major directions, and all vehicle trips represented in this diagram have one terminus inside the C.B.D. A ring road concept has been introduced into this diagram, and it is apparent that such a facility would carry substantial traffic loads. It has been determined that a ring road would become HIGHLY SIGNIFICANT as a DISTRIBUTOR of traffic to the downtown core. In contrast, Exhibit 6.G (ii) shows that the same ring road would be much LESS ATTRACTIVE as a BYPASS for non C.B.D. trips, assuming that various other conditions implicit in this diagram are valid.

The principal assumptions illustrated in this latter exhibit are that the two heaviest movements on the S.W. - N.E. axis, (one oriented toward Regent and Kathleen Streets; the other oriented generally toward Edmund Street, Howey Drive and the Kingsway) can be accommodated beyond the confines of the downtown area, or on routes operating independently from the downtown circulatory system.



SUDBURY AREA
TRANSPORTATION STUDY

DILLON

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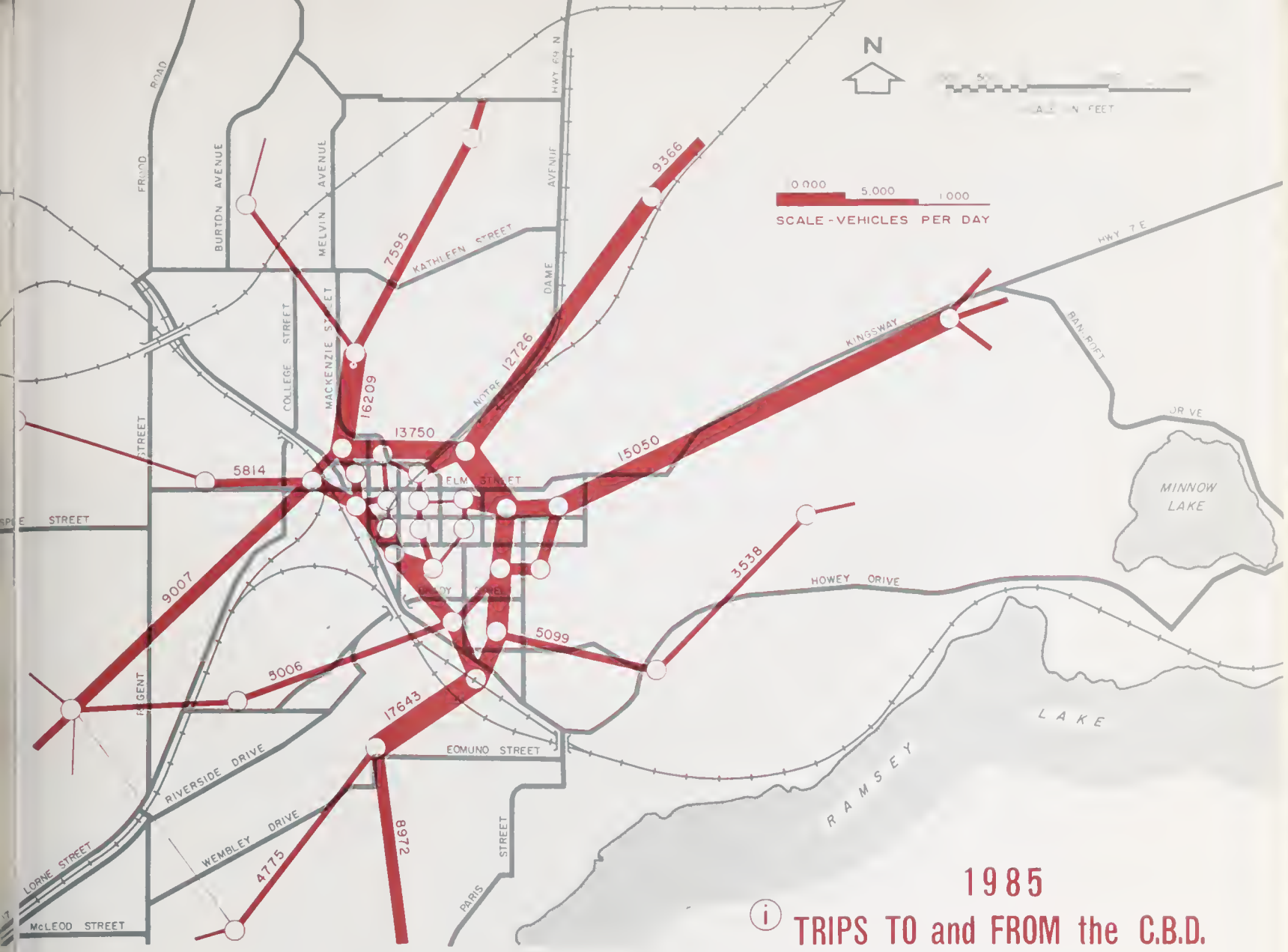
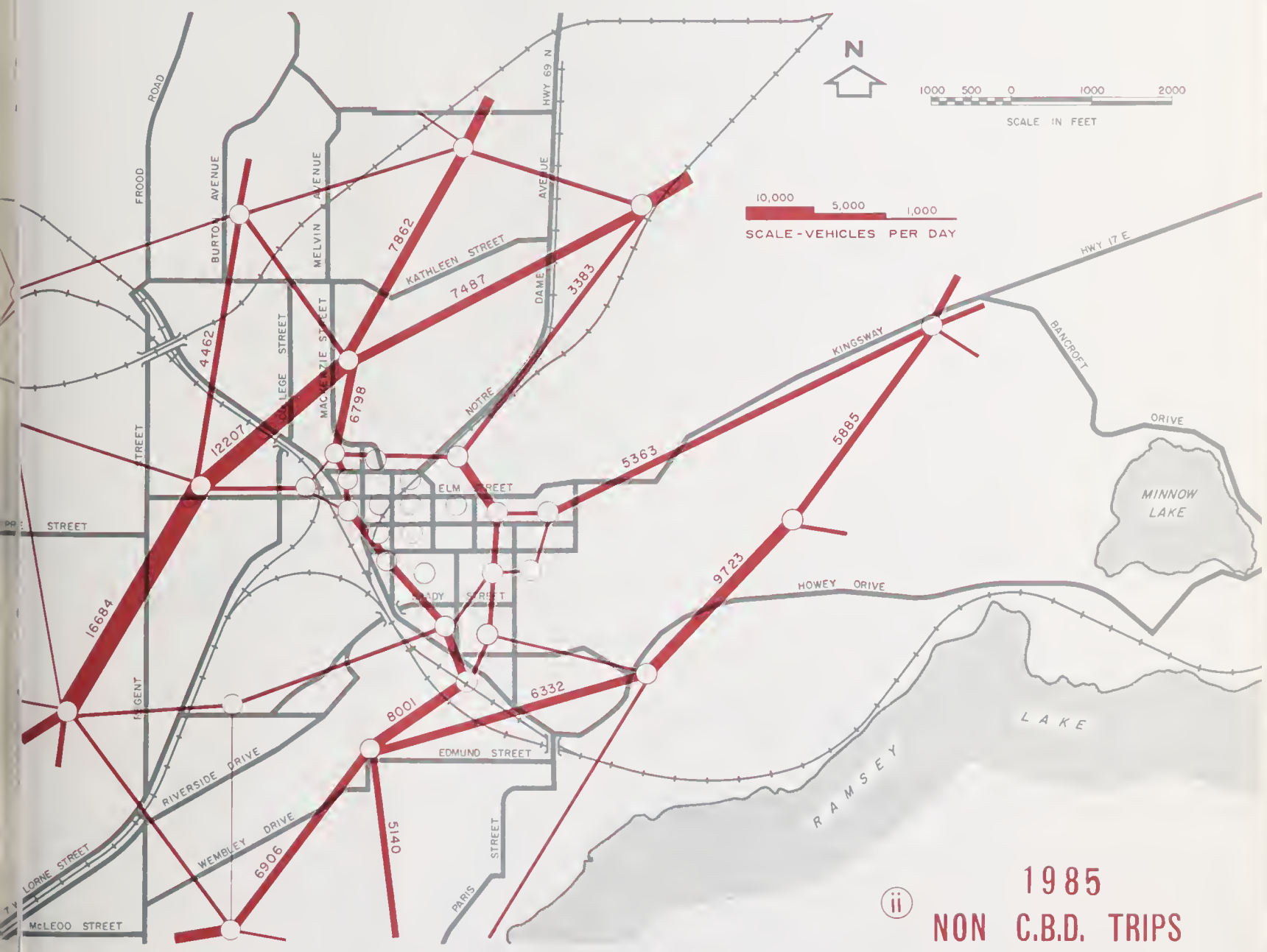


1985

(i) TRIPS TO and FROM the C.B.D.



1985

(ii) NON C.B.D. TRIPS

SUDBURY AREA TRANSPORTATION STUDY

COMPOSITE DESIRES

FOR TRIPS IN THE CENTRAL AREA

DILLON

6.8 ASSIGNMENT OF 1985 TRIPS TO THE EXISTING STREET SYSTEM

While the various desire line diagrams presented in this chapter serve to indicate the main orientation of trips throughout the City of Sudbury for the years 1963 and 1985, specific conclusions regarding street deficiencies can only be derived when these traffic volumes are related to the capacity of the available routes,i.e. by assignment of traffic to the street system and analysis of volume/capacity ratios.

In the exhibit 6.H the existing street system is represented as a "capacity plan", with the width of each section of street being drawn to represent the calculated 1963 street capacity. An assignment of 1985 traffic volumes has been made to the existing street network, and these are indicated by the red overlay.

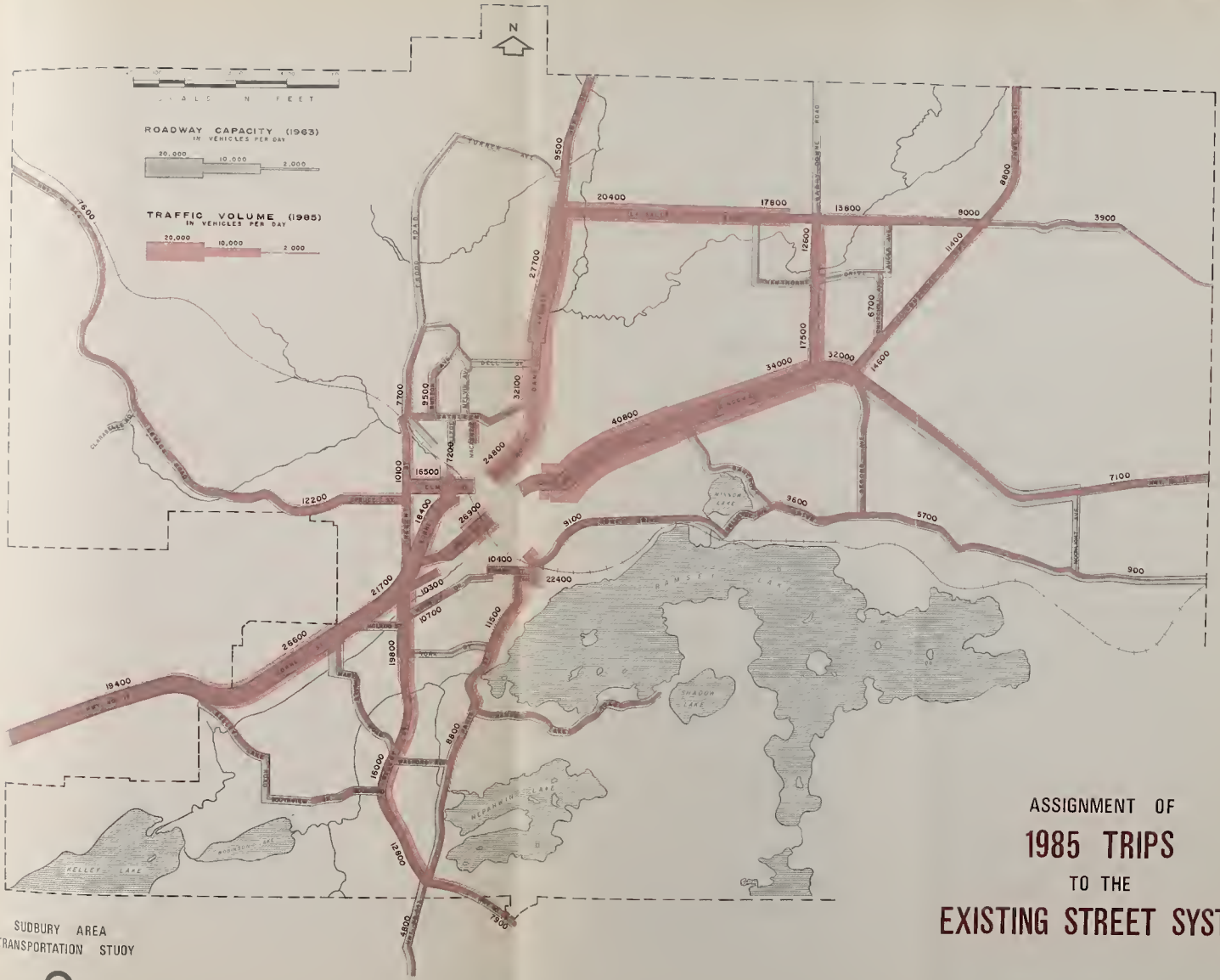
The assignment process used here was the "all or nothing" technique, so called because all trips between a given pair of origin and destination zones are loaded onto the shortest available route between the zones. No traffic is assigned to alternate route and no regard is given to the apparent overloading and resulting capacity restraints which may occur along the so called shortest route. This technique appears suitable in this case to demonstrate the substantial excess of demand occurring on many of the existing streets, and it is quite apparent from the exhibit that many streets would be substantially overloaded.

6.9 CONCLUSIONS AFFECTING FUTURE PLANNING

Chapter 3 has presented the results of various surveys which indicate the characteristics of existing traffic,and the analyses in this chapter have demonstrated the trip desires for the years 1963 and 1985, together with the future effects which might result from the imposition of 1985 traffic on the present street system. While these data provide part of the foundation for the preparation and evaluation of alternative traffic plans, two other bodies of data must be set forth before the transportation planning process can proceed.

The first ingredient vital to the planning process is: "THE DEFINITION OF GOALS AND OBJECTIVES": certain of these are set out in the Terms of Reference for this Study (see Section 2.2), others appear in the Major Thoroughfares Study (1961) by the Sudbury Planning Board and still others have been both stated and assumed in various parts of this report. In essence, the objectives are to prepare a transportation plan which complements the land use and encourages sound economic growth, while providing safe and efficient movement of persons and goods throughout the area.

The other necessary ingredient is "THE DEFINITION OF STANDARDS OF SERVICE". The standards set out by the Technical Coordinating Committee for the purposes of this Study are contained mainly in Appendix Exhibits A.G (Sheet 4) and A.J. These standards refer to such items as minimum roadway widths for each class of street, design speeds, critical



ASSIGNMENT OF

1985 TRIPS

TO THE

EXISTING STREET SYSTEM

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT 6:H

horizontal and vertical alignment criteria and the calculated capacity to be ascribed to various roadways. No standard for accident frequency is presented in this context, because it is generally assumed that every effort should be made to eliminate accidents to the greatest extent that economic considerations will permit.

When all the work so far described in this report is analyzed and related to the above objectives and standards, a whole series of problems and requirements emerge, and it is toward the solution and satisfaction of these that the subsequent Transportation Plan must be directed.

6.9.1 Route Capacity and other Problems between Downtown and the North-East Segment of the City

The existing traffic volumes (Exhibit 3.D) indicate that some 33,000 vehicles per day use the three routes: Notre Dame Avenue to La Salle Boulevard, Kingsway to Barrydowne Road and Kingsway to Falconbridge Highway. 1985 traffic in this direction is expected to amount to 73,000 vehicles per day (Exhibit 6.H), and the Composite Desire Lines (Exhibit 6.E) show that the major axis of this movement is the longer diagonal of the quadrilateral formed by Notre Dame Avenue, Barrydowne Road, La Salle Boulevard and Kingsway.

The present pavement on Notre Dame Avenue is somewhat restricted in width (36 feet), and the concentrated frontage development north of Kathleen Street makes it difficult to achieve even an effective 2 lane capacity (7,550 vehicles/day). Kingsway, at the time of the Study, was 2 lanes wide, but it has now been widened to 4 lanes (capacity 15,100 vehicles). Both streets are currently carrying substantially more than their theoretical capacities by virtue of fortuitous circumstances (preferential signal timing on Notre Dame Avenue, absence of major intersections on Kingsway), but even if these favourable conditions could be retained and maximum physical improvements made to both routes, they could not adequately handle future volumes. Hence, additional measure: i.e. one or more relief routes, will be required.

6.9.2 Physical Intersection and Alignment Problems South and West of Downtown

The most urgent problem in this area is the very difficult and intricate railway crossing and intersection problem existing at the intersection of Regent Street and Lorne Street. In addition to the four major approaches to the area, Riverside Drive, Ontario Street and Haig Street intersect at various oblique angles with the major streets, creating an operational and control problem which is practically insoluble except by the introduction of subways or overpass structures combined with street

closures and general physical rearrangement. The volume of 15,700 vehicles/day on Lorne Street east of the intersection would undoubtedly be far higher but for the capacity limitations imposed by the intersection. In practice, substantial volumes of traffic are now using minor streets including Ontario Street, Riverside Drive, Cross Street and Perreault Street to detour around the problem intersection, and filter through a residential area to approach downtown via Brady Street. Lorne Street and Brady Street presently carry some 27,000 vehicles daily to and from the downtown area and the volume will increase to 45,000 vehicles/day by 1985. While these two streets can theoretically each provide 4 lanes of capacity (15,100 vehicles/day), their total capacity is effectively reduced by the difficult intersection conditions.

Solution of the intersection problem, increased capacity, and provisions for re-routing at least some of the "less essential" traffic are required in this area.

6.9.3 Access and Circulation Capacity Problems related to the Central Business District

Downtown has problems which result from two conditions:

- the radial route characteristics of the area street system

- the topographical and railway barriers around downtown

The radial route system tends to funnel vehicles through the downtown area. 29,000 trips/day enter via Lloyd Street and Notre Dame Avenue, and a further 26,000 enter via Elm and Brady Streets. These figures are expected to be 65,000 and 45,000 respectively by 1985. The connections across Downtown (Elm Street, Lisgar Street, Minto Street etc.) are not well placed to accommodate these volumes. Interaction between heavy traffic volumes and downtown business uses as detrimental effects upon both, and every effort should be made to re-route as many as possible of the "non C.B.D." trips.

The barriers surrounding downtown severely limit the number of points of entry, as shown in Exhibit 4.B, and it should be a requirement of future plans to increase the number of entry points - particularly from the south and east - while at the same time developing effective "distributor" roads around the Central Business District.

6.9.4 Diverse Problems in all Parts of the City

Many specific problems are referred to in the tabulation of Major Route Characteristics (Exhibit A.H) and others are indicated by the capacity calculations in Exhibit A.G.

The solution to some of these is implied by the statements made (e.g. reference to poor horizontal or vertical alignment on a section would indicate that any work in this area should include realignment to bring it closer to the established standards). In addition, the imposition of 1985 traffic volumes will result in further capacity deficiencies on many routes. The major physical improvements required throughout the area will form part of the transportation plan and construction program to be developed later in this report, but there are various minor problems referred to in Exhibit A.H which can and should be dealt with by the City Engineering Department as part of their routine operations.

****

It seems appropriate at this point to interject a cautionary note. The plans and programs which will be developed and discussed in succeeding chapters will be generally formulated to meet the requirements of the system as indicated by the above mentioned analyses. Detailed FUNCTIONAL DESIGN will NOT, however, be part of this report. That is, when details of a project are developed for the purposes of this report, an alignment will be chosen and studied to determine whether the project is feasible from the engineering viewpoint, to show that it can generally meet the standards cited above and to prepare a preliminary cost estimate. The detailed positioning of the project on the ground, the design of geometric features and intersections, the designation of property requirements etc. as they relate to a specific project will NOT form part of the present Study, but will be the subject of preliminary engineering studies which can proceed only when the general concepts have received approval. When authorization is given to proceed with the design and construction of a facility to perform a specified function within the overall plan framework, then all the necessary detailed considerations relating to that facility will be subject to a thorough review.

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CHAPTER 7

EVALUATION OF PREVIOUS PROPOSALS

7.1 FIRST SELECTION OF NEW ROUTES

The data and analyses presented in the first six chapters of this report have demonstrated that there are a variety of deficiencies in the existing street system,and that the future growth of traffic will accentuate and aggravate current problems and create a number of new ones. Many problems can be alleviated by physical;i.e.operational improvements to existing routes, widening, intersection improvements, more sophisticated signal controls etc. However,any attempt to accommodate the total future traffic demands on existing streets alone would be highly costly,and distructive of existing buildings and property to the point of impracticality. Even with every possible improvement, it is quite likely that basic deficiencies in the layout of the street system would continue to render it incapable of handling the total 1985 traffic volumes,and for this reason,every effort must be made to discover new routes which could be developed to integrate with the existing street system and provide relief to problem areas.

A number of new route proposals have been put forward in recent years in the Major Thoroughfares Studies and Plan, in the Sudbury Official Plan and in other documents listed in Chapter 2, Section 2.5.

Data provided by the various traffic surveys undertaken in connection with this Transportation Study have indicated approximately where new routes might be warranted. Using the traffic analyses and the desire line diagrams, a preliminary selection of routes was made, from previously proposed projects (see Exhibit 7.A). These were evaluated in terms of overall engineering feasibility and traffic carrying capability. Where appropriate, it was assumed that all zone-to-zone movements in a given area of the desire line diagrams could be assigned to the selected route, to give a gross estimate of vehicles served by that route. For routes nearer the centre of Sudbury, the selected facilities were added to the link diagram representing the existing street system and new computer assignments were made of 1985 traffic to the modified street system. This procedure led to the determination of (a) anticipated traffic volumes on the new routes, and (b) the effectiveness of such routes in relieving critical portions of the present system.

In general, NONE of the new routes thus tested were found to be wholly effective in diverting traffic from overloaded segments of the street network. This is not to say that they would not contribute to the improvement of the existing system, but rather that their effects would not represent the optimum obtainable, in terms of traffic service.

There follows a very brief outline of the prospective new routes studied in this context. While these proposals are not in themselves recommended for construction as part of the Recommended Transportation Plan, certain modifications thereof and certain other projects serving similar functions may be identified among those comprising the plan described in Chapter 8.

7.2 CRITERIA FOR EVALUATION OF NEW ROUTES

While every effort has been made throughout this study to recognize and give full weight to all possible effects of new route proposals, the clear intent of the terms of reference is to seek ways and means of providing for EFFICIENT MOVEMENT OF VEHICULAR TRAFFIC throughout the area for the coming 20-year period.

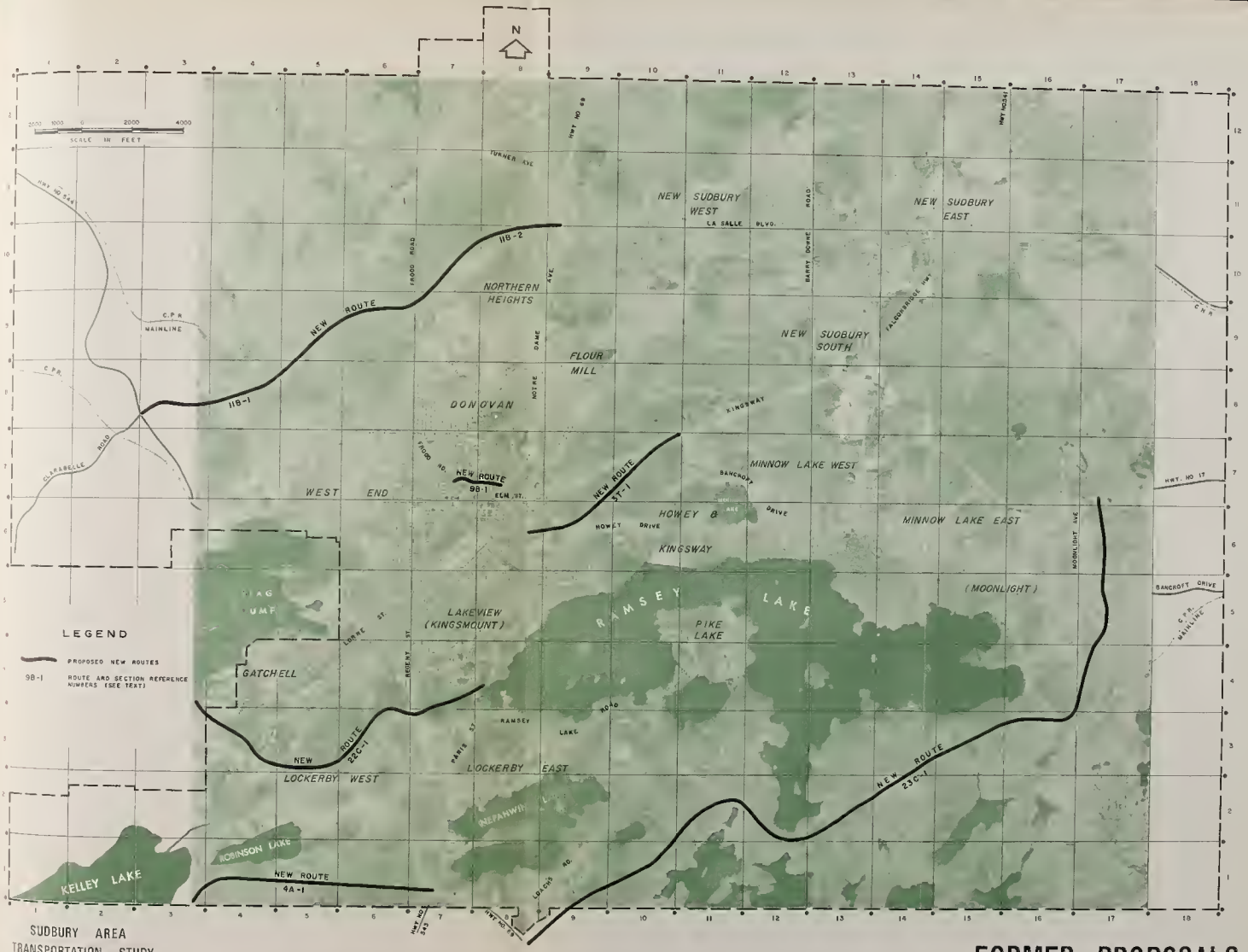
Certain of the proposals studied may be most beneficial in a planning sense or for aesthetic purposes, in that they provide communication or access in areas where these are necessary or desirable (the route 23C south east of Ramsey Lake would be in this category). Other proposals could form very important elements of the transportation plan over a longer period of time (Route 11B from Clarabelle to La Salle Boulevard and Route 22C via Ramsey Creek would exemplify this). For the purposes of the 20-year Transportation Plan, however, the effectiveness and efficiency of a facility as a traffic carrier were deemed to be the most important criteria. It is on this basis that projects mentioned in this chapter have been discarded from the plan, but it should be continually emphasized that there MAY be good and sufficient reason for these to form part of land use or recreational plans both during and beyond the 20-year period.

7.3 DISCUSSION OF DISCARDED PROPOSALS

ROUTE 3T BRADY STREET EXTENSION

From: Brady/Drinkwater (Exhibit 7.A
To: Kingsway/Bancroft Ref. 10E 7N)

This route was proposed in the Highway 17 Connecting Link report (December 1959): it would serve to relieve Kingsway between Carleton Street and Bancroft Drive. Considerable widening of the Kingsway between Bancroft Drive and Falconbridge Road would be required to complement the combined capacity of the two almost parallel routes west of Bancroft Drive, and a fairly elaborate interchange would be required to accommodate the various movements at Bancroft Drive. This project would give only partial relief to the Kingsway route, and is therefore less favourable than projects which could either relieve Kingsway over a greater length (e.g. Route 2T-1 discussed in Chapter 9), or offer relief to the congested connections with downtown Sudbury via Lloyd and Carleton Streets, (as Route 1T-3 of the Recommended Plan, Chapter 8).



SUDBURY AREA TRANSPORTATION STUDY

DILLON

FORMER PROPOSALS

SELECTED FOR STUDY

EXHIBIT 7-A

ROUTE 4A SOUTH-WEST BYPASS

From: Hwy. 17/Kelley Lake Rd. (Exhibit 7A
To: Hwy. 69/Paris St. Ref. 5E 1N)

This route has been the subject of discussion over a period of years, and an alignment has been studied south of Kelley Lake. Such a routing would serve only the longer distance bypassable traffic between Highway 69 and Highway 17, amounting to some 1,500 trips per day in 1985, and conversely, would serve very few of the peak daily work trips associated with MacFarlane Lake, Rheault, Lockerby and Copper Cliff. The actual relief afforded to other vital routes in the Sudbury Area would not be significant, and the trip assignment does not warrant a high construction priority within the context of other urban roadway requirements.

Evidently, this route would not make a major contribution toward meeting the needs of the Sudbury urban area. Nevertheless, within the framework of the PROVINCIAL highway network serving the region, it might well be considered as a useful bypass route for traffic not wishing to penetrate the urban area. For example, heavy trucks (which,in accordance with the Recommended Plan presented in Chapter 8, would otherwise use McLeod Street to travel between Highway 69 and Highway 17), could be conveniently rerouted via such a bypass, and could thus benefit from a saving of travel time.

ROUTE 9B NEW ROUTE VIA FIR STREET, LOUIS STREET, etc.

From: Frood/Lorne (Exhibit 7A
To: Notre Dame/Louis Ref. 7E 7N)

This route was suggested in the Urban Renewal Study, and elsewhere. It could be a most useful route around the north side of the downtown area, but traffic assignments show that a well aligned, 4-lane arterial route would be required. Several factors could make this quite difficult and costly to develop: the improvement of the existing Lorne Street underpass to accommodate 4 lanes adequately would be a considerable task in itself. In addition, a horizontal alignment developed to arterial street standards would probably result in damage to the Sudbury Star building, or to the Sudbury Public Library (or to both), to say nothing of potential demolition and property requirements north of the three existing churches. The accommodation of traffic movements in the vicinity of Mackenzie Street, Fir Street, Elgin Street and Hospital Crescent would be a difficult matter to resolve, and very little relief would be afforded those problems existing at the Lorne/Frood/College intersection, unless some form of grade-separated interchange could be provided.

The development of a new underpass connection between Pine Street and Beech Street is recommended in Chapter 8 (Route 5B). This would seem to be a superior alternative, in that such a route would accommodate east-west movement simply and expeditiously, and would provide major connections to north-south routes at Lorne/Pine, Elgin/Beech and

and Lisgar/Beech. Furthermore, the development of an additional underpass of the C.P.R. between Pine and Beech Streets offers some prospect of relief to the existing Lorne/Frood/College intersection, and to the grade crossing on Elm Street West.

ROUTE 11B NEW ROUTE

From: Clarabelle/Levack Hwy. (Exhibit 7A
To: Notre Dame/La Salle Ref. 4E 9N)

This route is shown in the Sudbury Official Plan. It could prove to be a most useful long-term project, and possibly some right-of-way should be reserved. Although it would serve Levack, Copper Cliff, New Sudbury and Garson, traffic assignments indicate a volume of only 2,600 vehicles per day by the year 1985. It would, therefore, seem to be far less urgent than many of the other projects recommended. Moreover, this project would involve some 3 miles of new roadway, costing between $800,000 and $1,000,000: it is felt that this money might be more effectively utilized for other projects during the 20-year period to 1985.

ROUTE 22C NEW ROUTE VIA RAMSEY CREEK

From: Lorne/Kelley Lake Rd. (Exhibit 7A
To: Paris St. Ref. 5E 3N)

This route appears in the (1959) Highway 17 Connecting Link report as a north-south link acting in conjunction with Notre Dame Avenue. 1985 traffic assignments indicate that some 4,300 vehicles per day would use this route, but that no significant relief of traffic problems on Lorne Street, York Street, Martindale Road, Kelley Lake Road etc. would be provided. Thus, it cannot be recommended as part of the present transportation plan.

ROUTE 23C NEW ROUTE SOUTH-EAST OF LAKE RAMSEY

From: Hwy. 69/Hunter (Exhibit 7A
To: Hwy. 17/Moonlight Ref. 10E 1N)

This route was included as an outer ring road in the Official Plan, and preliminary appraisal suggests that some roadway in this area would be a valuable asset to the Sudbury Area street network. Some 6 miles of construction or reconstruction would be involved, while traffic assignments indicate that only some 600 vehicles per day would be served. The development of a scenic route could well attract additional volumes of recreational trips, however, and as with other projects mentioned, the reservation of a roadway allowance, and the development of a local service or recreational route might prove to be desirable for considerations other than traffic.

****

It seems relevant to emphasize one again that the evaluation of all project proposals has been carried out on the basis of traffic service and the objective has been to recommend a transportation network to serve the area efficiently with particular reference to peak hour and normal weekday trips. The rejection of the above-mentioned projects or others which have been put forward from time to time, is not intended to detract

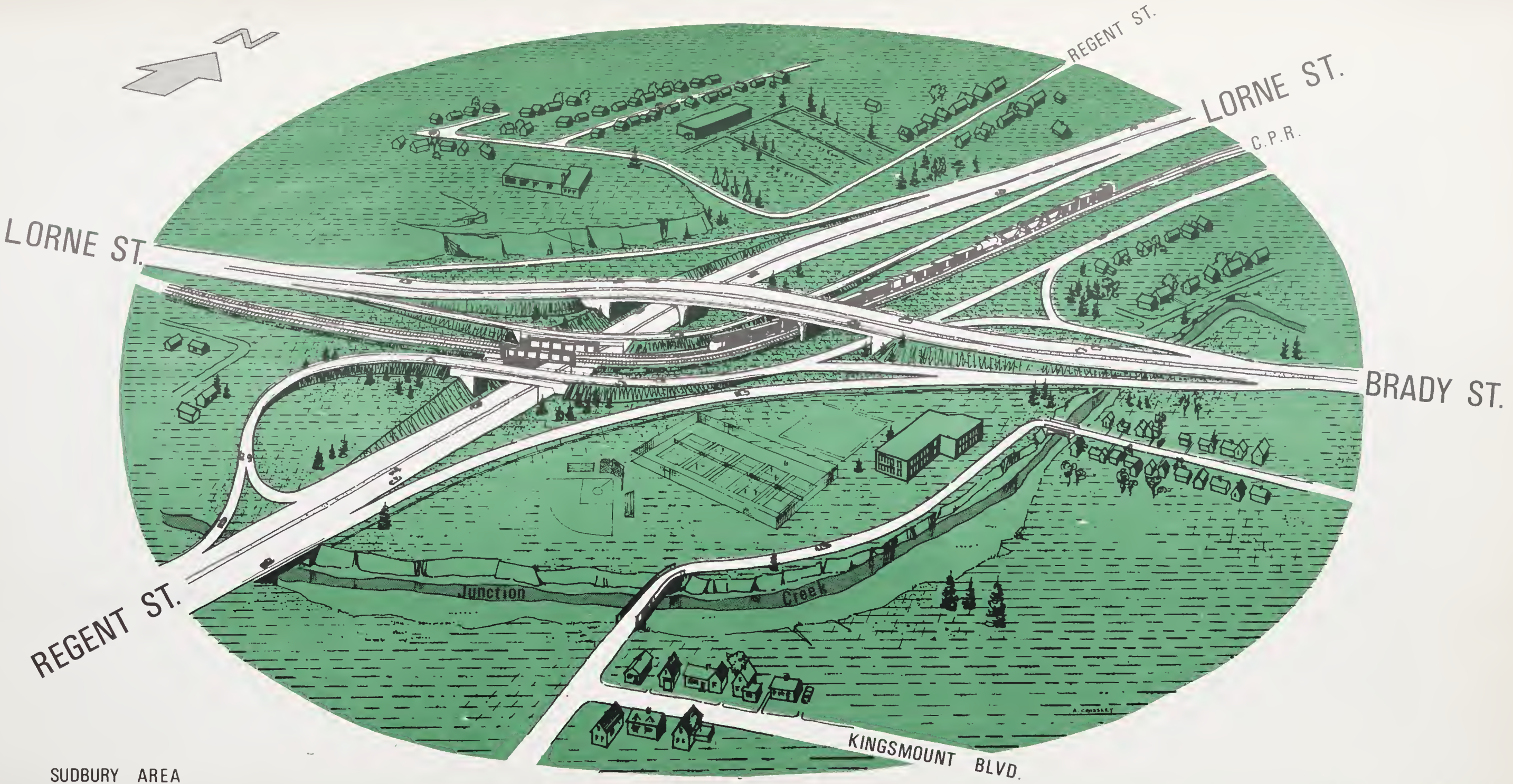
from their merits or significance for purposes other than normal daily traffic service. Hence, some of these at least should certainly remain as part of the Official Plan, to indicate the direction of development beyond the period of this report.

7.4 DEVELOPMENT AND ANALYSIS OF FURTHER PROPOSALS

The above evaluations of previous proposals were presented to the Study Technical Coordinating Committee and discussed at some length. As a result of the Committee meetings, it was decided to proceed with the development and analysis of two principal alternative schemes towards the definition of a 20-year plan.

One of these schemes (initially designated Scheme "A") contained a proposal to extend Brady Street eastward to the Falconbridge/Kingsway intersection. After considerable analysis and testing, it was found that this scheme raised several basic problems which eventually led to its rejection. Discussions of some of the major features of this scheme are contained in Chapter 9 "Alternatives to the Recommended Plan".

The other Scheme (formerly designated Scheme "B") included the new route from Notre Dame/Kathleen to Barrydowne Road. This scheme was analyzed and tested in considerable detail, and after careful examination and further development, it became the basis for the Recommended Transportation Plan presented in Chapter 8.



SUDBURY AREA
TRANSPORTATION STUDY

DILLON

REGENT - LORNE - BRADY
INTERCHANGE

CHAPTER 8

THE RECOMMENDED TRANSPORTATION PLAN

8.1 PLAN REQUIREMENTS

Various surveys of existing traffic conditions have been presented and discussed in Chapter 3.

These surveys have revealed a number of deficiencies in the existing street network, including locations with high accident incidence, intersections where calculated capacities are exceeded, poor alignment, awkward at-grade railway crossings, important streets lacking sidewalks and other items which are detrimental to the operation of the Street System. While certain of these problems can only be tackled within the framework of a large scale, long term plan, many of the items referred to, once they have been identified, can be corrected at modest expense within the context of operation and maintenance routines of regular City forces. It is confidently expected that the Roads and Traffic Engineering Divisions of the City Engineer's Department will competently deal with these matters without the need for any further mention in this report and, indeed, it is more than likely that some of the items have already received attention during the period between the date of the surveys and the publication of this report.

Some of the deficiencies referred to in Chapter 3 have deeper significance, however, because they can only be satisfactorily eliminated within the framework of a comprehensive, long range plan. In addition, the traffic forecasts presented in Chapter 6 indicate that there will be future problems which can only be solved within the context of an integrated program. It is these larger scale proposals that will be the major concern of this report, and such items as signal re-timing, minor regrading, detailed intersectional layouts and sidewalk reconstruction plans will only be included in the work descriptions and cost estimates incidentally, where they form a part of the plan for a route in the future major street system.

The plan for the major street system has been conceived to provide solutions for the major existing and forecast problems, including those dealing with:

- Route capacity north-eastward from downtown towards the New Sudbury area

- Intersection and route capacity in the south west portion of the City, particularly around the Lorne-Regent intersection

- Circulation and access capacity in and around downtown, particularly the provision of distributor and bypass routes.

8.2 INTEGRATION OF ROUTE PROPOSALS

The projects discussed later in this chapter and shown on the accompanying exhibits represent a comprehensive 20-year plan to serve vehicular traffic needs in Sudbury. It must be very strongly emphasized that, while each of the projects shown has merit in itself, this plan is essentially a series of INTERDEPENDENT facilities, wherein each makes an integral contribution to the system.

The projects shown have been evaluated on a CONCEPTUAL basis: that is, the need for a given project as part of the whole system has been determined, and any basic change in the plan (particularly the omission or the insertion of a route) should be thoroughly evaluated to determine the repercussions upon all other elements of the proposed system, before the plan is changed.

The projects have NOT been subjected to complete FUNCTIONAL DESIGN. The precise location of a given project has not been finally determined, and hence, there is scope for analysis of alternative alignments or revisions to the details of a given route prior to final engineering design. It must be emphasized that any alternatives which may be examined at the functional design stage should serve a similar traffic function to the currently proposed project, and should make the same basic connections. Any changes which might be made in the specific service of a facility should be evaluated and tested within the context of overall NETWORK function.

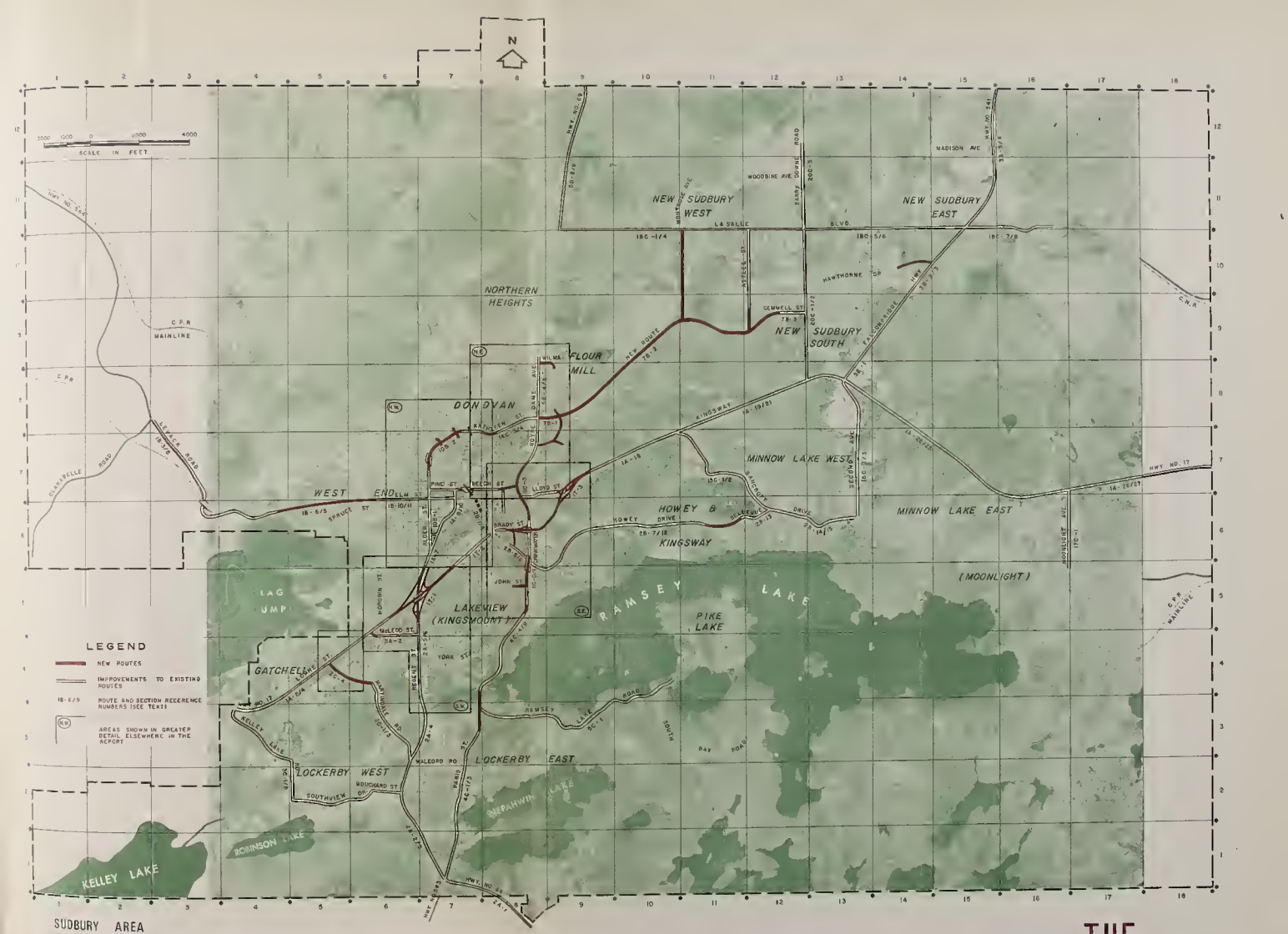
Only when the CONCEPTUAL PLAN for the WHOLE STREET SYSTEM has been approved and adopted can FUNCTIONAL DESIGN for one or more SPECIFIED ROUTES or projects be carried out. In the functional design phase alternate routings and detailed property requirements would be examined and costs estimated, in preparation for actual construction.

8.3 RELATIONSHIP WITH OTHER CONSTRUCTION PLANS

The project descriptions and cost estimates in this report are generally concerned with the factors of right-of-way, pavement, curbs etc. as required to provide vehicular service.

In certain cases where it is especially relevant, the costs of ancillary works, particularly the provision of adequate culverts and sidewalks, are included.

There are, however, a number of other related policies and construction programs which should be integrated with the transportation plan. One such major program is the provision of adequate storm sewers throughout the area. The layout and estimated costs of these are contained in the "Storm Drainage Report for the City of Sudbury", and it is assumed that storm sewers will be developed concurrently with roadways in order to take advantage of any construction and cost benefits accruing from their proper integration.



SUDBURY AREA TRANSPORTATION STUDY

DILLON

THE RECOMMENDED PLAN

EXHIBIT 8-A

1985 TRIPS
ASSIGNED TO
THE RECOMMENDED PLAN

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT B-8

{

DETAILS

of the

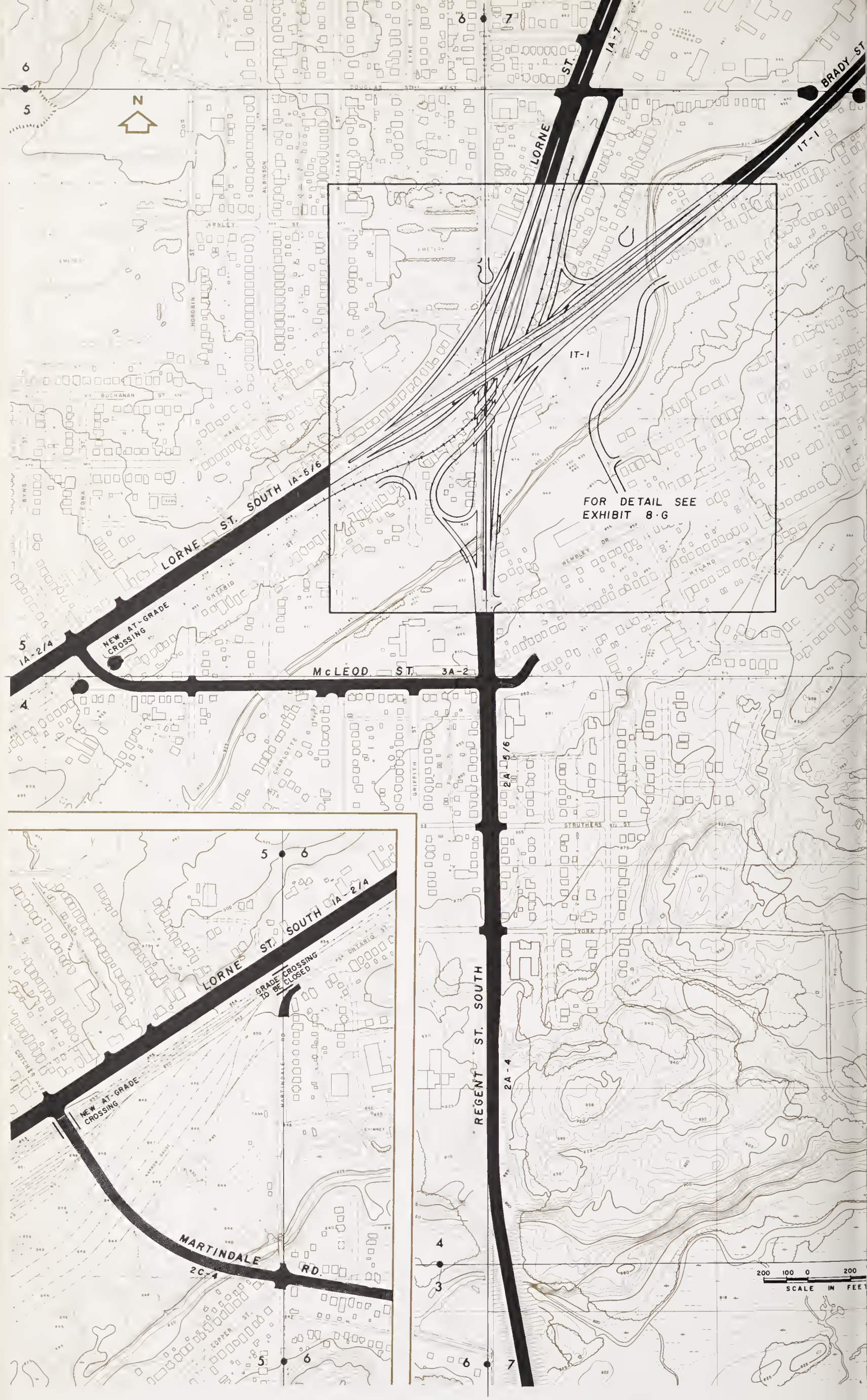
RECOMMENDED PLAN

in the

CENTRAL AREA
OF SUDBURY

(N.W.) Exhibit 8.E Exhibit 8.F (N.E.)

(S.W.) Exhibit 8.C Exhibit 8.D (S.E.)



SUDBURY AREA
TRANSPORTATION STUDY

DILLON

THE RECOMMENDED PLAN
S.W. CENTRAL AREA

EXHIBIT

N

NOTRE DAME AVE.

3B-2/4

ST.

8-1

LLOYD ST.

ELM ST. EAST

1A-14/16

11C-3

FOR DETAIL SEE EXHIBIT 8·J

1T-3

ROAD CLOSED

ST.

BRADY ST.

1T-2

ROAD CLOSED

MINTO

SHAUGHNESSY ST.

DRINKWATER

11C-2

FOR DETAIL SEE EXHIBIT 8·H

VAN HORNE ST

ELGIN ST.

2B-5/6

11C-0/1

FOR DETAIL SEE EXHIBIT 8·K

PARIS ST.

4C-4/9

8 9

6 5

7 6

200 100 0 200 400

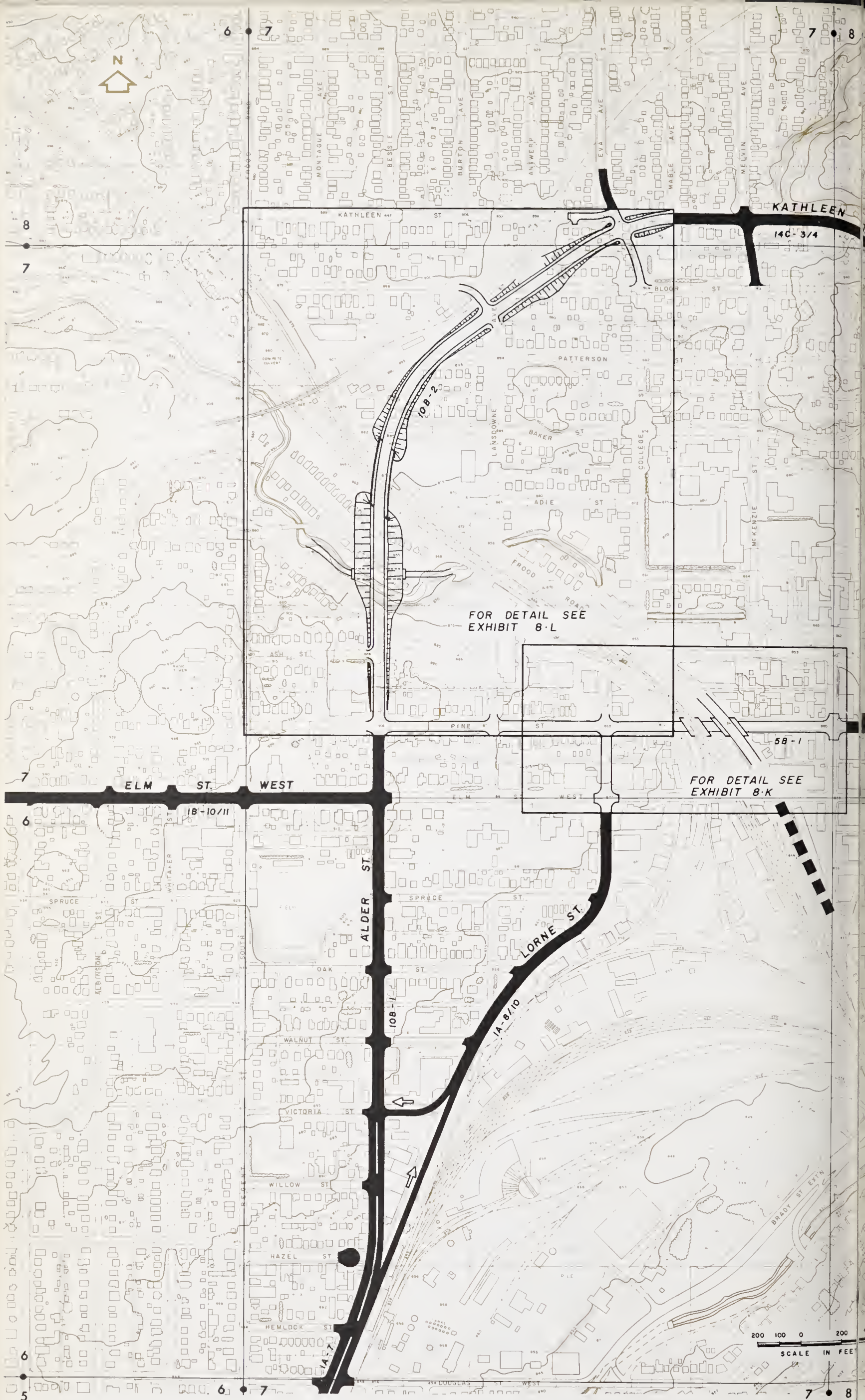
SCALE IN FEET

SUDBURY AREA TRANSPORTATION STUDY

THE RECOMMENDED PLAN
S.E. CENTRAL AREA

DILLON

EXHIBIT 8·D



SUDBURY AREA
TRANSPORTATION STUDY

DILLON

THE RECOMMENDED PLAN
N.W. CENTRAL AREA

EXHIBIT

SUDBURY AREA
TRANSPORTATION STUDY

THE RECOMMENDED PLAN
N.E. CENTRAL AREA

DILLON

EXHIBIT 8 · F

As well as roadway construction, sidewalks, storm sewers, street lighting, and intersection signalization which would proceed concurrently with the transportation plan, there are a number of policies that should also be pursued simultaneously. In particular, the control of access to major arterial streets should be carefully regulated as suggested for Notre Dame Avenue in Section 3.4. Within the context of zoning bylaws and other regulatory powers, the City should control the number of accesses and driveways that connect with an arterial street, specify minimum driveway design standards, and ensure that facilities for car washing and parking have adequate entrance and exit capacities.

8.4 ELEMENTS OF THE RECOMMENDED PLAN

The following descriptions listed in sequence, according to Route and Section Numbers, briefly outline the proposals included in the Recommended Transportation Plan for the 20-year period 1965 to 1985.

Exhibit 8.A shows the proposals which constitute the Recommended Plan, and the same information is presented at a larger scale on the Exhibit O.A to be found in the pocket at the back of this report.

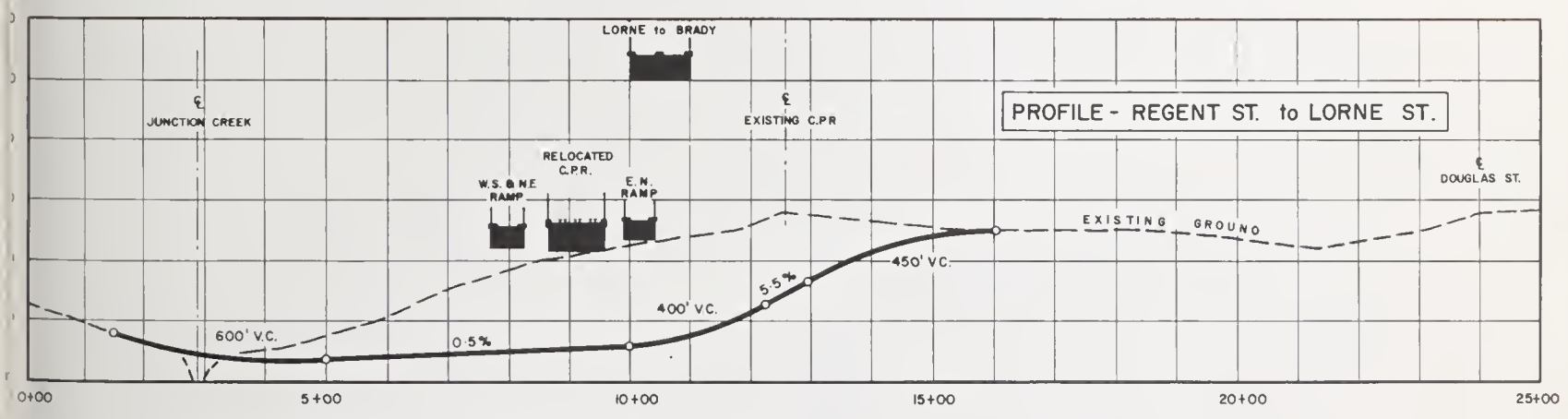
Exhibit 8.B shows the traffic volumes assigned to the recommended routes and provides a comparison with the future daily route capacities. Exhibits 8.C to 8.L show portions of the recommended plan in greater detail.

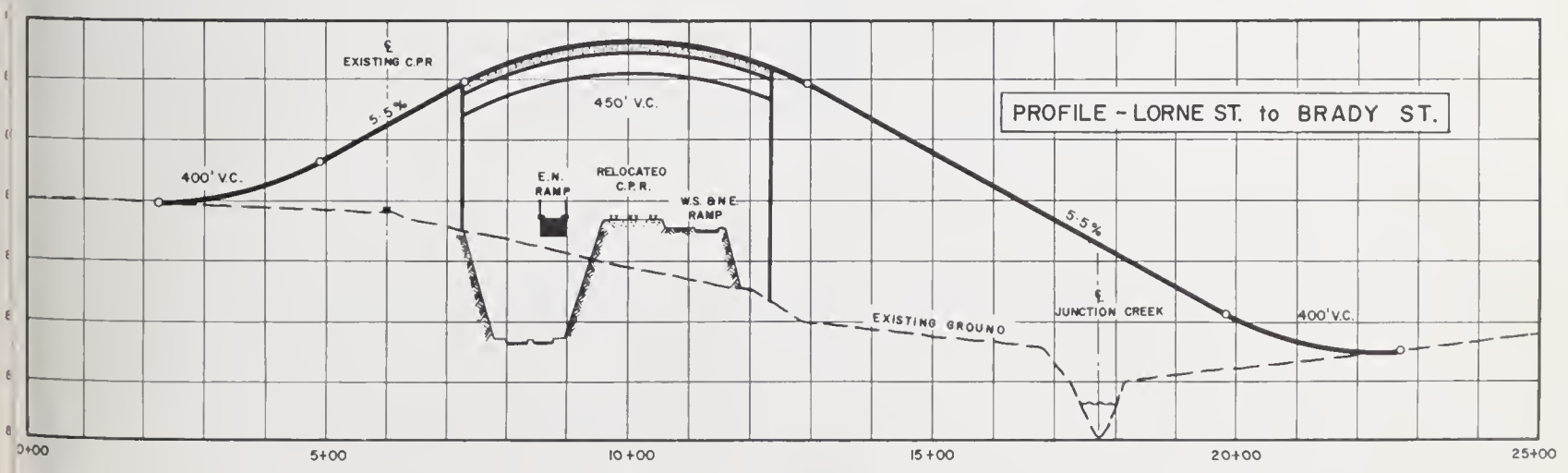
****

SECTION 1T-1 LORNE STREET - BRADY STREET

From: Horobin St. (Exhibits 8.0,8.C,8.G
To: Douglas St. Grid Ref. 7E 5N)

Both the north-south route (Regent/Lorne) and the east-west route (Lorne/Brady) should be separated from the C.P.R. tracks and from one another. The recommended plan (Exhibit 8.G) provides for all interchange movements except the northbound to westbound and the eastbound to southbound, which would use McLeod Street. Two major structures are proposed to take Lorne/Brady and Regent/Lorne respectively over and under the C.P.R., and interchange movements would require two additional structures. Extensive revisions to the existing street pattern would also be required as well as the relocation of Junction Creek and the construction of two culverts west of this project. Lorne Street would be developed to 6 lanes, and 4 of these would be carried over the structure and continued as a controlled access facility, to meet the existing 4-lane section of Brady Street. South of the project, Regent Street would be developed to 6 lanes, and 4 of these would be carried northward under the structures to Lorne Street and the proposed Alder/Kathleen Route.





UDBURY AREA
TRANSPORTATION STUDY

REGENT - LORNE - BRADY INTERCHANGE (1T-1)

DILLON

EXHIBIT 8·G

SECTION 1T-2 BRADY STREET

From: Douglas St. (Exhibits 8.D,8.H
To: Drinkwater St. Grid Ref. 8E 6N)

The existing Brady Street Throughway will require some improvement, including the provision of a median. Present connections at Grey Street and Minto Street should be deleted, while both right-of-way and pavement should be widened between the existing C.P.R. underpass and Drinkwater Street, to provide a fully controlled access facility.

An off-ramp should be provided for eastbound to northbound movements from Brady to Elgin Street. Eastbound-northbound and eastbound-southbound off movements, and southbound-westbound and northbound-westbound on movements would be accommodated at the Brady/Drinkwater interchange. Movements between Drinkwater Street and points eastward would not be provided for at this location because inherent capacity and property restrictions make additional interchange movements impractical. Thus, trips from Paris Street and downtown Sudbury destined eastward, together with trips from the east to these locations would use Lloyd Street.

SECTION 1T-3 BRADY STREET EXTENSION

From Drinkwater St. (Exhibits 8.D,8.J
To: Kingsway/Argyle Grid Ref. 9E 6N)

From the Brady/Drinkwater interchange it is proposed to project Brady Street north-eastward as a 4-lane facility to meet Kingsway at Argyle Street, thus helping to relieve the downtown circulation system by providing an independent route for through trips. Alternative routes, eastward from the Brady/Drinkwater interchange, to meet the Kingsway at Bancroft Drive or at Falconbridge Road are discussed as Sections 3T-1 and 2T-1 in Chapters 7 and 9 respectively.

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SECTION 1A-1 HIGHWAY 17, LORNE STREET SOUTH

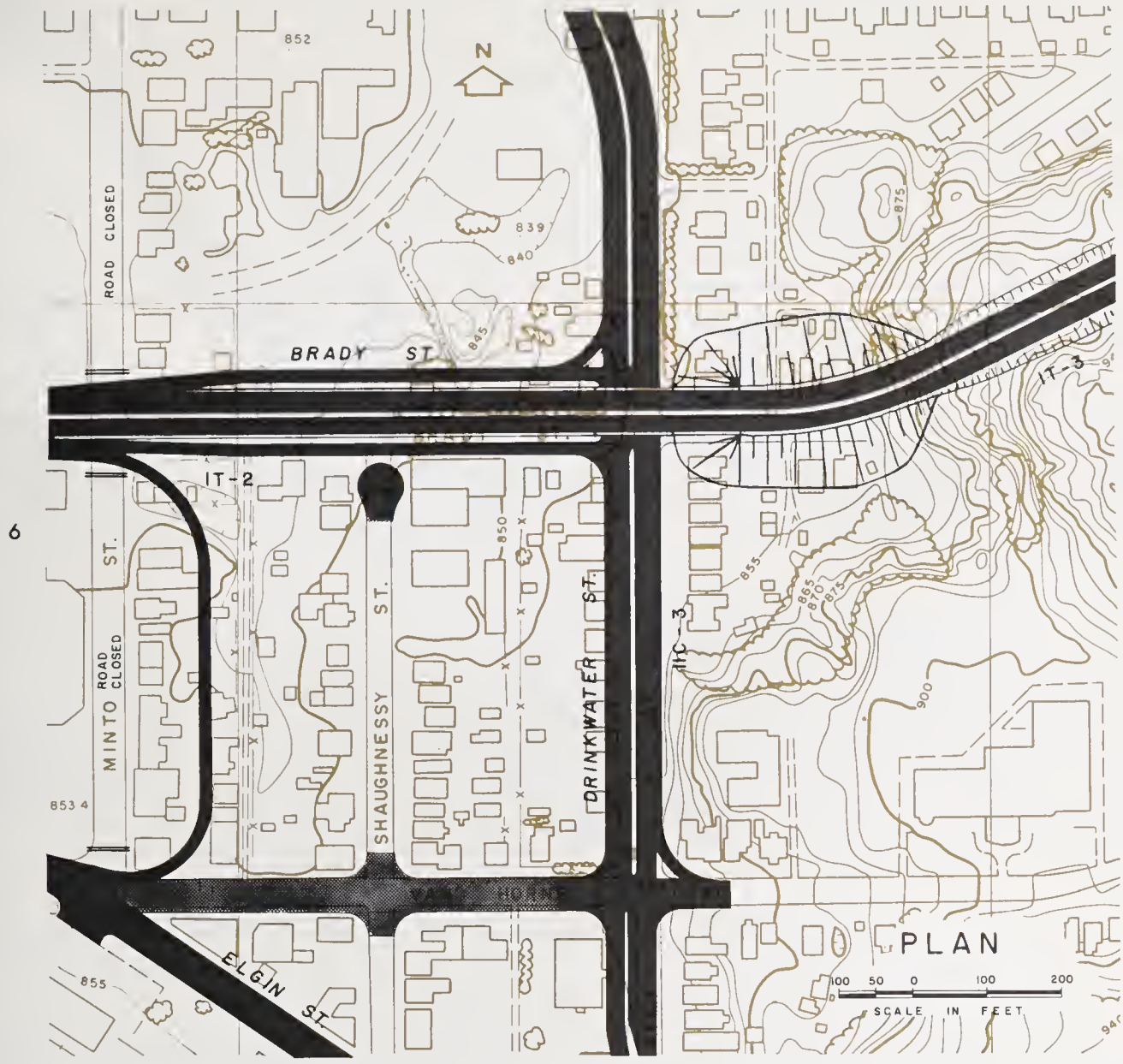
From: W. City Limits (Exhibit 8.A
To: Kelley Lake Rd. Grid Ref. 3E 4N)

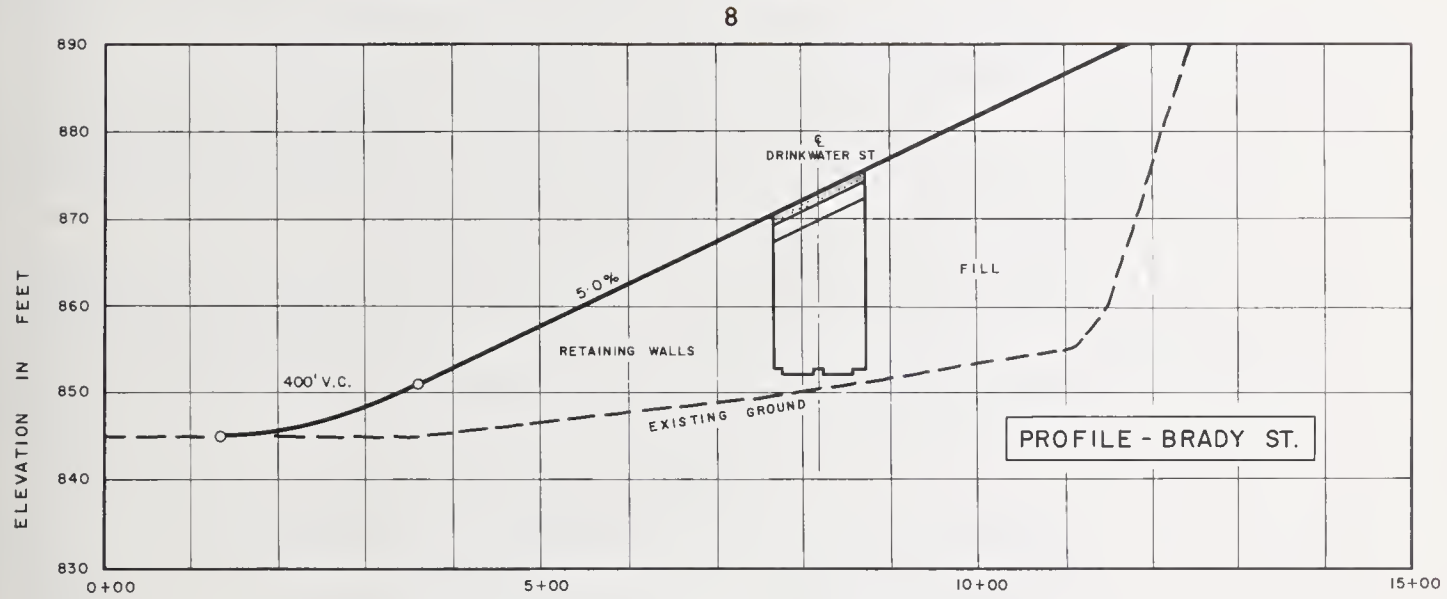
The existing 4-lane pavement should be maintained with resurfacing or minor improvements as and when required.

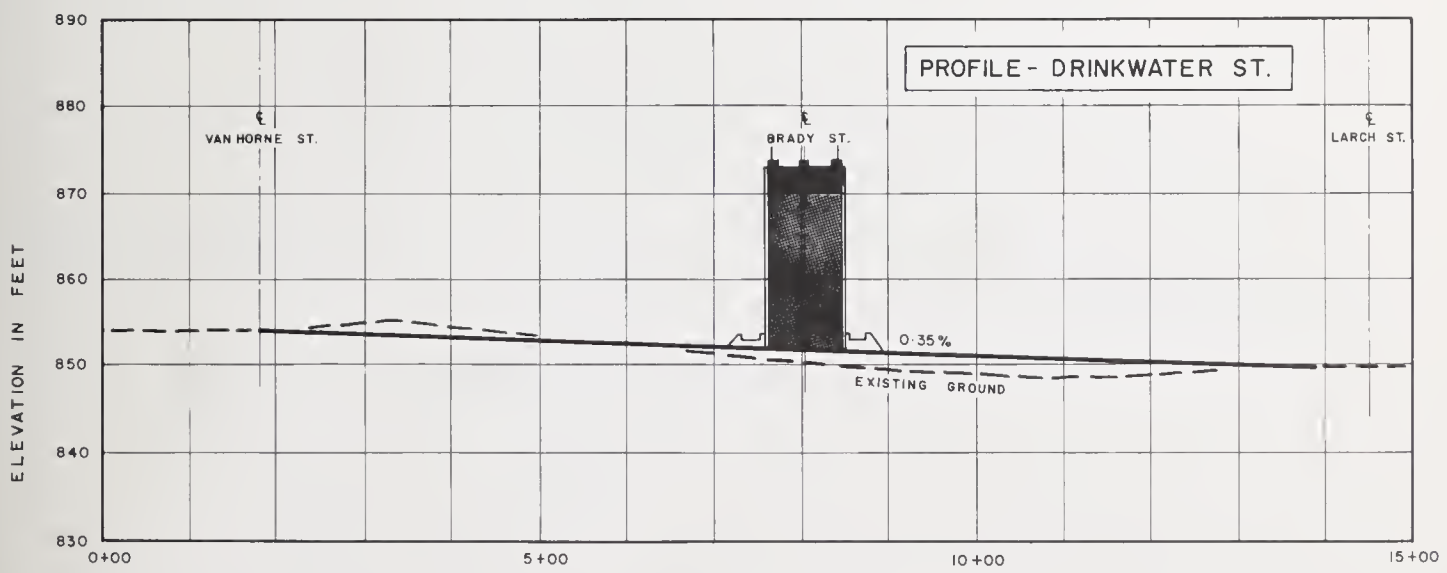
SECTION 1A-2/4 LORNE STREET SOUTH

From: Kelley Lake Rd. (Exhibits 8.A,8.C
To: Horobin St. Grid Ref. 5E 4N)

This section will require widening to 6 lanes, and the existing roadway will need reconstruction within the 20-year period. The timing of the widening will depend on the growth of traffic, and will be considerably affected by any re-use or





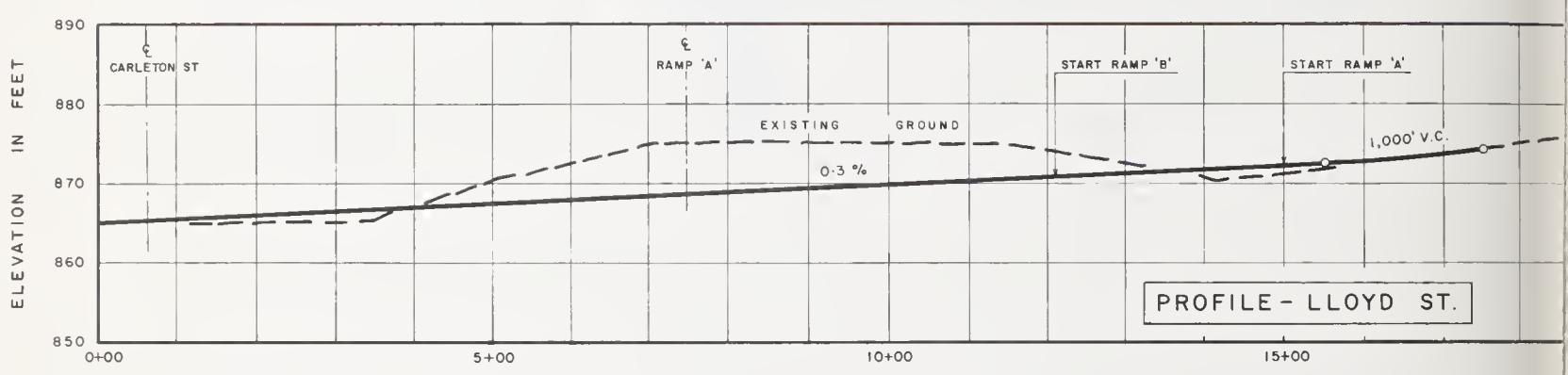


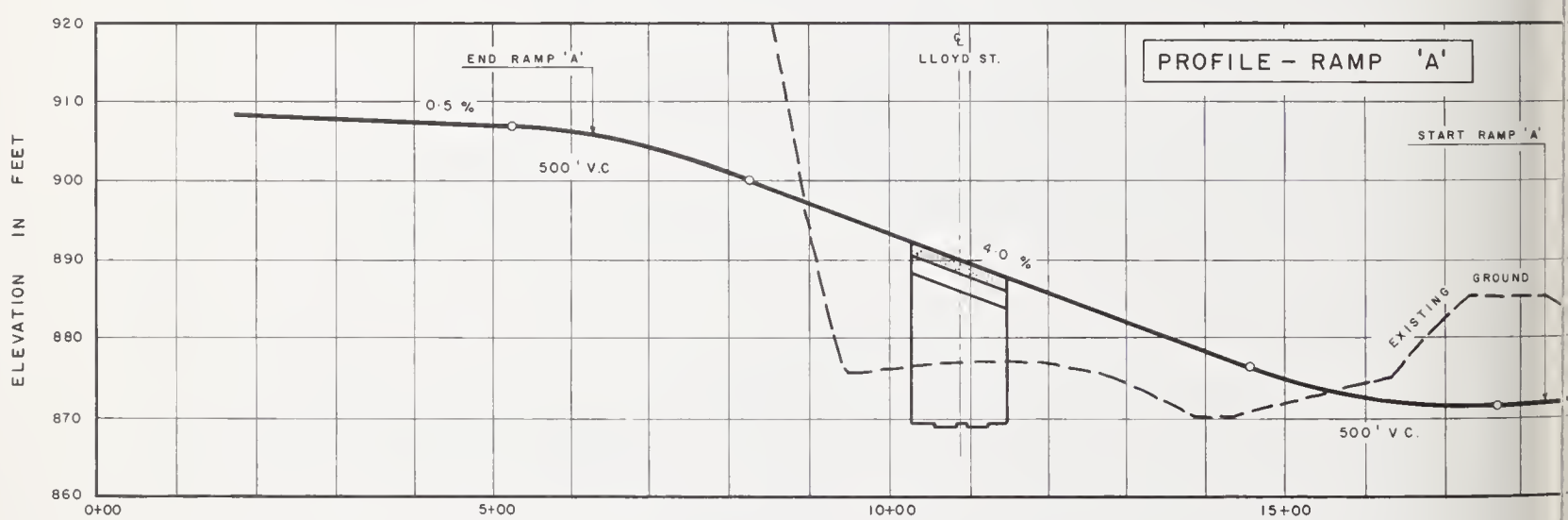
SUDBURY AREA
NSPORTATION STUDY

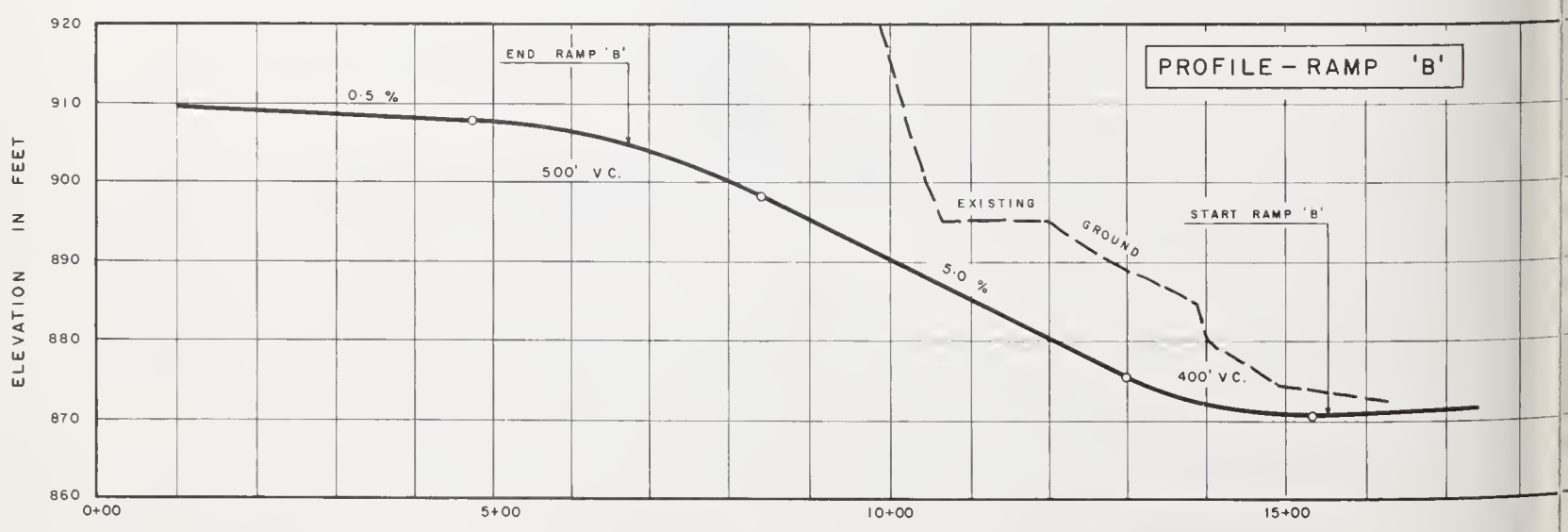
BRADY - DRINKWATER INTERCHANGE (1T-2)

DILLON

EXHIBIT 8·H







SUDBURY AREA TRANSPORTATION STUDY

DILLON

BRADY - LLOYD - KINGSWAY INTERCHANGE (1T-3)

EXHIBIT

redevelopment of the C.P.R. lands fronting the street: it has been assumed that some land for street widening will be available from the C.P.R. The existing Martindale Road at-grade crossing of the C.P.R. tracks has a poor angle of approach at Lorne Street,which combines with difficult signalized intersections at Lorne/Martindale and Ontario/Martindale,and results in a high accident frequency and excessive delays. It is proposed that this at-grade crossing be closed,and that two alternative crossings be developed to connect the realigned Martindale Road and the improved McLeod Street with the Lorne/Gutcher and Lorne/Byng intersections respectively.

SECTION 1A-5/6 LORNE STREET SOUTH: BRADY STREET EXTENSION

From: Horobin St. (Exhibits 8.O,8.C,8.G
To: Douglas St. Grid Ref. 7E 5N)

This section of roadway forms part of the proposed Regent/Lorne/Brady interchange described under Section 1T-1.

SECTION 1A-7 LORNE STREET SOUTH

From: Douglas St. (Exhibits 8.C,8.E
To: Alder St. Grid Ref. 7E 6N)

This section of Lorne Street would become part of the major north-south route by connecting with Regent Street South through the new Lorne-Brady-Regent interchange 1T-1. 6 lanes would be required between the interchange ramps and the Alder-Lorne intersection, and it has been assumed that the necessary property would be acquired on the north-west side of Lorne Street, since the C.P.R. property may not be available in this area. Some improvement of the Lorne/Douglas intersection would be required, and Hazel Street should be closed west of the new Lorne/Alder route.

SECTION 1A-8/10 LORNE STREET SOUTH

From: Alder St. (Exhibit 8.E
To: Elm St. W. Grid Ref. 7E 6N)

Although this section of Lorne Street will perform a less vital function within the context of the future street network, due to the provision of the other important facilities via Alder/Kathleen and Brady Street, it will be important to maintain 4-lane capacity. This will involve acquisition of property in the vicinity of Spruce Street for the improvement of horizontal alignment, as well as the replacement of existing pavement within 10-20 years.

SECTION 1A-11/13 ELM STREET WEST AND EAST

From: Lorne St. (Exhibits 8.D,8.E
To: Lisgar St. Grid Ref. 8E 7N)

The precise function and status of this route will depend upon the circulatory system adopted for the downtown area. With the proper development of various other proposals,it may be feasible to reduce traffic on this section of roadway or to close it completely to traffic.

The very built-up nature of this section tends to preclude substantial improvements of its traffic carrying capabilities.

To some extent,the proposed development of the Pine-Beech connection and the improvement of the Brady Street Throughway should reduce the importance of Elm Street and provide relief from the present heavy traffic volumes.

SECTION 1A-14/16 ELM STREET EAST,LLOYD STREET

From: Lisgar St. (Exhibit 8.D
To: Carleton St. Grid Ref. 8E 7N)

A 4-lane cross-section will be required on this section at an early date, with appropriate improvements in horizontal and vertical alignment over the hill between Young and Carleton Streets. A new intersection should be developed with the proposed Drinkwater/Notre Dame Avenue connection, and some widening on the approaches to this intersection as well as at the Lisgar/Elm and Lloyd/Carleton intersections should be provided.

The Pearl/Elm intersection poses a most difficult situation which may hamper the proper development of Elm Street. It is recommended that some other connection to Pearl Street be developed to permit its closure north of Elm.

Depending upon the rate of growth of downtown, and upon the effect of other routes, it is likely that 6 lanes will be required toward the end of the 20-year planning period.

SECTION 1A-17 LLOYD STREET - KINGSWAY

From: Carleton St. (Exhibits 8.D,8.J
To: Argyle St. Grid Ref. 9E 7N)

This section should be widened to 4 lanes prior to, or in conjunction with, the construction of the Lloyd/Brady/Kingsway interchange (1T-3), with additional widening at the Lloyd/Carleton intersection.

SECTION 1A-18 KINGSWAY

From: Argyle St. (Exhibit 8.A
To: Old City Limits Grid Ref. 9E 7N)

The widening of this section to 4 lanes will be required at an early date; certainly not later than the construction of the Lloyd/Brady/Kingsway interchange 1T-3. Further widening to 6 lanes will be required before the end of the 20-year planning period, and this will involve considerable property acquisition on one side of the street. In order to prepare cost estimates, it has been assumed that property will be acquired on the south side of the roadway.

SECTION 1A-19/21 KINGSWAY

From: Old City Limits (Exhibit 8.A
To: Falconbridge Rd. Grid Ref. 11E 8N)

This section has recently been improved to 4 lanes, and will require further widening to 6 lanes during the next 20 years. The scheduling of this additional widening will depend upon traffic growth and upon the construction of various other facilities. Some improvement to the Bancroft/Kingsway intersection will also be necessary.

SECTION 1A-22/25 KINGSWAY

From: Falconbridge Rd. (Exhibit 8.A
To: Moonlight Ave. Grid Ref. 15E 7N)

4 lanes will be required on this section within the next 15 to 20 years, with appropriate additional widening in advance of the Kingsway/Falconbridge intersection. Some improvement of the Second Avenue approach to the Kingsway is required, and this could be achieved by the realignment of Second Avenue for an improved angle of intersection. In the event that the alternate plan (incorporating Route 2T-1 or some similar facility) is adopted, then the Kingsway/Second Avenue intersection should be relocated some 1,000 feet to the east of Falconbridge Road,to avoid a complicated 5-legged situation.

SECTION 1A-26/27 KINGSWAY,HIGHWAY 17

From: Moonlight Ave. (Exhibit 8.A
To: E. City Limits Grid Ref. 17E 7N)

Highway 17 east of Moonlight Avenue and beyond the City will require widening to 4 lanes before the end of the planning period. Any construction between Moonlight Avenue and the City Boundary should only proceed, however, when widening of the highway is undertaken to Coniston or beyond.

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SECTION 2A-1 HIGHWAY 69, REGENT STREET SOUTH

From: S. City Limits (Exhibit 8.A
To: Paris Street Grid Ref. 7E 1N)

The impact of Highway traffic combined with that from the residential and commercial developments around Loach's Road and McFarlane Lake will make four traffic lanes necessary within 10 to 15 years. Considerable improvement of the Highway 69/Algonquin/Loach's intersection will be required also: such improvement should include further widening for turning lanes, channelizing islands, easing of approach grades and signalization.

SECTION 2A-2/3 REGENT STREET SOUTH

From: Paris St. (Exhibit 8.A
To: Walford Rd. Grid Ref. 6E 2N)

Considerable improvement of the Paris/Regent intersection is required: this should include widening of approaches and further channelization within the intersection. Improvement at Bouchard/Regent should include rock removal and curbed corner radii in order to gain improved sight distance. Improvements at Walford/Martindale/Regent will include property acquisition to allow for relocation of the intersection northward and achieve better horizontal and vertical alignments. This roadway should be brought to 4-lane arterial standard with curbs, gutters and sidewalk as soon as practicable.

SECTION 2A-4 REGENT STREET SOUTH

From: Walford Rd. (Exhibits 8.A,8.C
To: York St. Grid Ref. 7E 3N)

It is understood that this section will be improved to 4-lane arterial standards during 1965. It has, therefore, been omitted from present considerations although, depending upon traffic growth and the future improvement of the Paris Street route, it is anticipated that 6 lanes will be warranted before the end of the 20-year planning period.

SECTION 2A-5/6 REGENT STREET SOUTH

From: York St. (Exhibit 8.C
To: Wembley Dr. Grid Ref. 7E. 4N)

Six lanes will be required on this section of roadway, probably within the next 10 years. Property for additional right-of-way will be needed and it is proposed that this should be acquired on the east side between York and McLeod Streets, and on the west side between McLeod and Wembley Streets. Some additional widening of approaches and general intersection improvement will be required at York/Regent and McLeod/Regent.

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SECTION 3A-1 ONTARIO STREET

From: Martindale Rd. (Exhibit 8.C
To: McLeod St. Grid Ref. 6E 4N)

With the proposed closing of the existing C.P.R./ Martindale Road at-grade crossing (see Section 1A-2/4) and the opening of a new railway crossing at McLeod/Byng/Lorne, this section of Ontario Street will revert to local street classification,and will be closed immediately west of McLeod Street.

SECTION 3A-2 McLEOD STREET

From: Ontario St. (Exhibit 8.C
To: Regent St. S. Grid Ref. 6E 5N)

McLeod Street should be widened to 46 feet and improved as soon as possible. It is proposed to extend McLeod Street westward, with an at-grade crossing of the C.P.R. tracks to intersect with Lorne Street (Section 1A-2/4) opposite Byng Street, and the new intersection would require approach widening and signalization. With the construction of the new interchange at Lorne/Regent/Brady, McLeod Street would become the main route for northbound to westbound, and eastbound to southbound traffic between Highway 69 and Highway 17.

In the event that a decision is made to proceed with the South-West Bypass (New Route 4A discussed in Chapter 7),then an estimated 1,500 trips per day would be diverted from McLeod Street to the new route by the year 1985. While the benefit from this transfer of trips would be significant,it is nevertheless anticipated that the proposed 4-lane capacity of McLeod Street would continue to be utilized.

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SECTION 1B-1/2 HIGHWAY 544,LEVACK ROAD

From: W. City Limits (Exhibit 8.A
To: Clarabelle Rd. Grid Ref. 2E 10N)

It is anticipated that this section will be maintained at its present width until such time as Highway 544 is improved and widened beyond the City Limits to a 4-lane cross-section. Such widening would be done by the Department of Highways, and would not likely be contemplated until development intensifies in the Azilda-Levack areas, or until traffic volumes on the new route connecting to Timmins increases substantially.

SECTION 1B-3/5 LEVACK ROAD

From: Clarabelle Rd. (Exhibit 8.A
To: Fisher Plant Grid Ref. 3E 7N)

This portion of roadway will require widening and improvement to achieve a well-aligned 48 ft. wide pavement some time toward the end of the 20-year planning period.

The existing C.P.R. underpass structure is very poorly aligned,with poor angles of approach, inadequate sight distances and only 12 feet of headroom. In view of these physical deficiencies,an early replacement with an adequate 4 lane structure appears desirable. The work to be done on this section of roadway would include a moderate amount of rock cut, ancillary drainage works and channel improvements.

SECTION 1B-6/9 LEVACK ROAD,ELM STREET WEST

From: Fisher Plant (Exhibit 8.A
To: Elm/Albinson Grid Ref. 5E 6N)

Two alternative projects for improving the entry of Highway No. 544 into the City were explored. The recommended project involves the construction of a new roadway through a rock outcrop, extending the existing Elm Street West alignment westerly to meet the Levack Highway. This project would affect a minimum of property, as compared with the alternative route using Spruce Street.

SECTION 1B-10/11 ELM STREET WEST

From: Albinson St. (Exhibits 8.A, 8.E
To: Alder St. Grid Ref. 6E 6N)

This section of Elm Street West should be improved and upgraded to permit four lanes of moving traffic on a 48 ft. wide pavement, with adjustments to the vertical alignment where necessary, with minor improvements to the intersection at Regent Street, and with more extensive improvement of the intersection at the proposed north-south route via Alder Street.

SECTION 1B-12/13 ELM STREET WEST

From: Alder St. (Exhibit 8.E
To: Lorne St. Grid Ref. 7E 6N)

This section should be maintained and improved to accommodate four lanes of moving traffic on a 44 ft. wide pavement. The existing parking meters will eventually have to be removed, and the Elm/Lorne intersection should be improved.

SECTION 1B-14 LORNE STREET NORTH

From: Elm St. W. (Exhibit 8.E
To: Frood Rd. Grid Ref. 7E 7N)

It is anticipated that this section will continue to provide essential service in the north-south direction, connecting with College Street. The underpass of the C.P.R. will require widening to accommodate four lanes of traffic. With the proposed improvement of Pine Street and its connection to Beech Street by way of a new underpass at the C.P.R. tracks, the Lorne/Pine intersection will undoubtedly require improvement. The Elm/Lorne intersection should be improved to handle existing traffic volumes, which will not be greatly reduced by the construction of the various new proposals suggested herein, and both the horizontal and vertical alignment of Lorne Street should be improved.

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SECTION 2B-1/4 ELGIN STREET NORTH AND SOUTH

From: Beech St. (Exhibits 8.D, 8.E
To: Van Horne/Minto Grid Ref. 8E 6N)

The status of this section is difficult to determine, except within the context of a downtown circulation plan. The possibility of developing a new connection by extending Frood Road to meet Elgin Street near Cedar Street should not be disregarded, although it was NOT found to be essential under present conditions. In any case, this street should be maintained as a four lane facility with such general improvements as appear warranted or feasible.

SECTION 2B-5/6 ELGIN STREET SOUTH

From: Van Horne/Minto (Exhibits 8.D, 8.K
To: Nelson/Lourdes/ Grid Ref. 8E 6N)
Morris

The importance of this section will decrease when the proposed overpass of the C.P.R. yards joining Drinkwater Street and Paris Street is constructed. It is recommended that Elgin Street be depressed to underpass the new facility, and that it be developed and maintained as a 4-lane roadway 44 ft. in width. It is assumed that the existing Nelson Street bridge will continue in operation to serve the needs of the local area, and that a certain amount of traffic from Howey Drive will continue to use Elgin Street.

SECTION 2B-7/12 MORRIS STREET,HOWEY DRIVE

From: Nelson/Lourdes/ Elgin (Exhibit 8.A Grid Ref. 10E 6N)
To: Bellevue Ave.

These roadways will require improvements and widening to carry four lanes of traffic. The sharp corner at Howey Drive and Bellevue Ave. will require improvement, involving property acquisition.

SECTION 2B-13 BELLEVUE AVENUE

From: Howey Dr. (Exhibit 8.A
To: Bancroft Dr. Grid Ref. 12E 6N)

This section should be improved and widened to accommodate four lanes of traffic, and the intersection with Bancroft Drive should be redesigned to better serve major traffic movements in the east-west direction. Greater definition and possibly channelization is needed. Proper accommodation of bus stops, and adjustments to horizontal and vertical alignments should be included in the improvement scheme.

SECTION 2B-14/15 BANCROFT DRIVE

From: Bellevue Ave. (Exhibit 8.A
To: Second Ave. Grid Ref. 13E 6N)

This section will eventually require widening to accommodate four lanes of traffic. Consideration should be given to minor horizontal alignment improvements when pavement is rebuilt.

SECTION 2B-16/21 BANCROFT DRIVE

From: Second Ave. (Exhibit 8.A
To: E. City Limits Grid Ref. 17E 5N)

It is anticipated that this section will be maintained and upgraded to 2-lane arterial standards, and be adequate to handle traffic volumes over the 20-year period.

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SECTION 3B-1 FALCONBRIDGE ROAD

From: Kingsway (Exhibit 8.A
To: Churchill Ave. Grid Ref. 13E 8N)

This section of roadway requires widening to 48 ft. (4 lanes) at an early date. Such widening should incorporate additional lanes and channelization approaching Kingsway, and additional pavement at the Churchill Ave. intersection. At the latter, some channelization is warranted, to protect vehicles waiting to make a left hand turn. The approach grade on Churchill Ave. and the angle of approach should also be improved.

SECTION 3B-2/5 FALCONBRIDGE ROAD

From: Churchill Ave. (Exhibit 8.A
To: La Salle Blvd. Grid Ref. 14E 9N)

This section will require widening and improvement to provide four lanes of traffic in 10 to 15 years. Also, some additional widening approaching the La Salle Blvd. intersection will be necessary. One or more additional collector street connections should be provided between Churchill Ave. and La Salle Blvd. during this period.

SECTION 3B-5/8 FALCONBRIDGE ROAD, HIGHWAY 541

From: La Salle Blvd. (Exhibit 8.A
To: Maley Dr. (N. City Limits) Grid Ref. 15E 11N)

This section will require widening to four lanes before the end of the planning period. Some additional improvements should be undertaken at the intersections with collector streets, particularly at Carmello Ave. and Madison Ave.

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SECTION 4B-1/2 DURHAM STREET

From: Elgin St. (Exhibits 8.D,8.E
To: Beech St. Grid Ref. 8E 6N)

The status of this section will depend entirely upon the ultimate plan for downtown circulation.

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SECTION 5B-0 PINE STREET

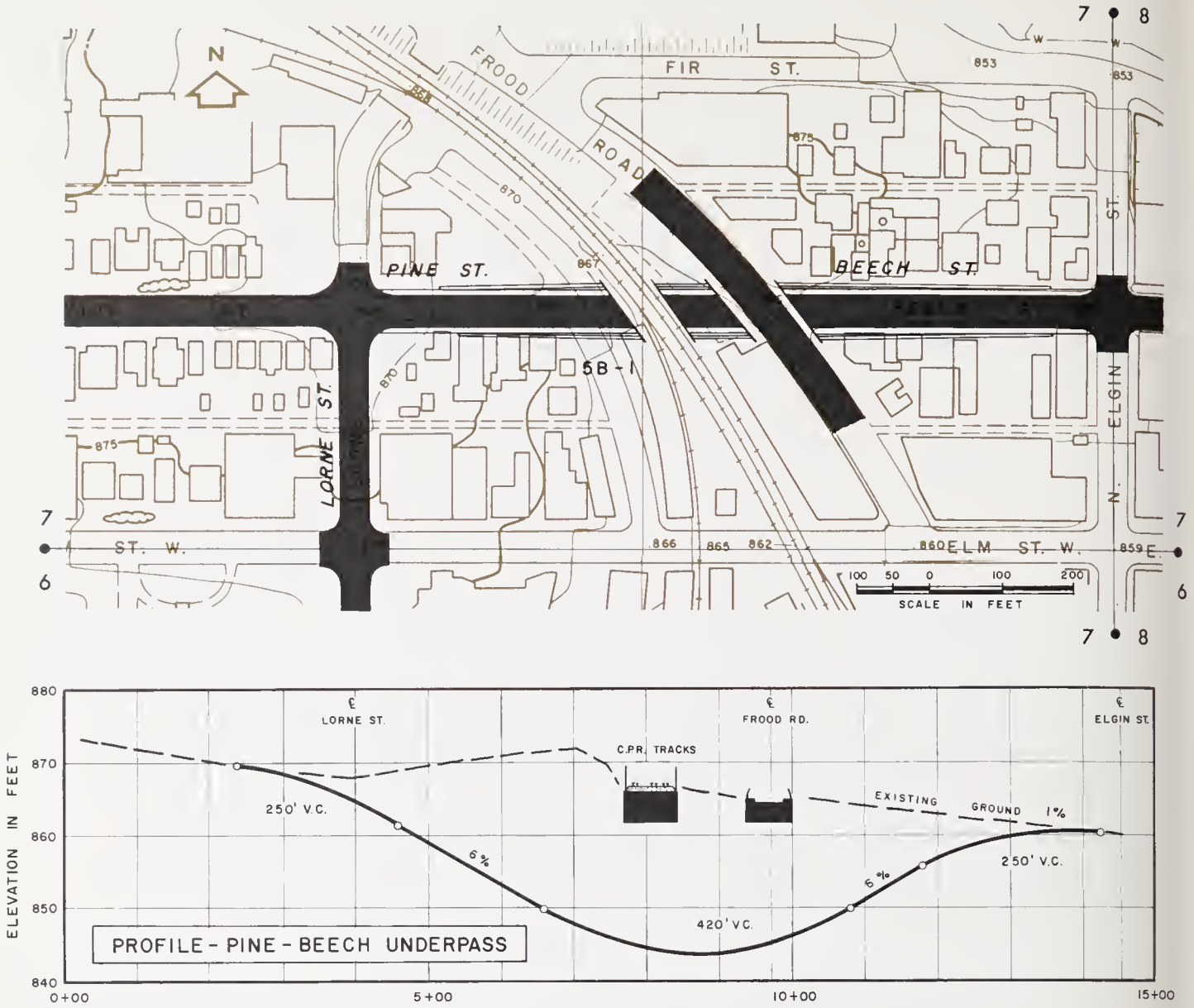
From: Alder St. (Exhibits 8.E,8.L,8.K
To: Lorne St. Grid Ref. 7E 7N)

This section should be upgraded to provide for 4-lane operation by widening the pavement to 46 feet and eliminating curb parking. Intersection improvements at Alder St. and Lorne St. should also be undertaken. This work should be coordinated with the provision of a new underpass connection with Beech Street. Pine Street west of Alder should become a one-way westbound street.

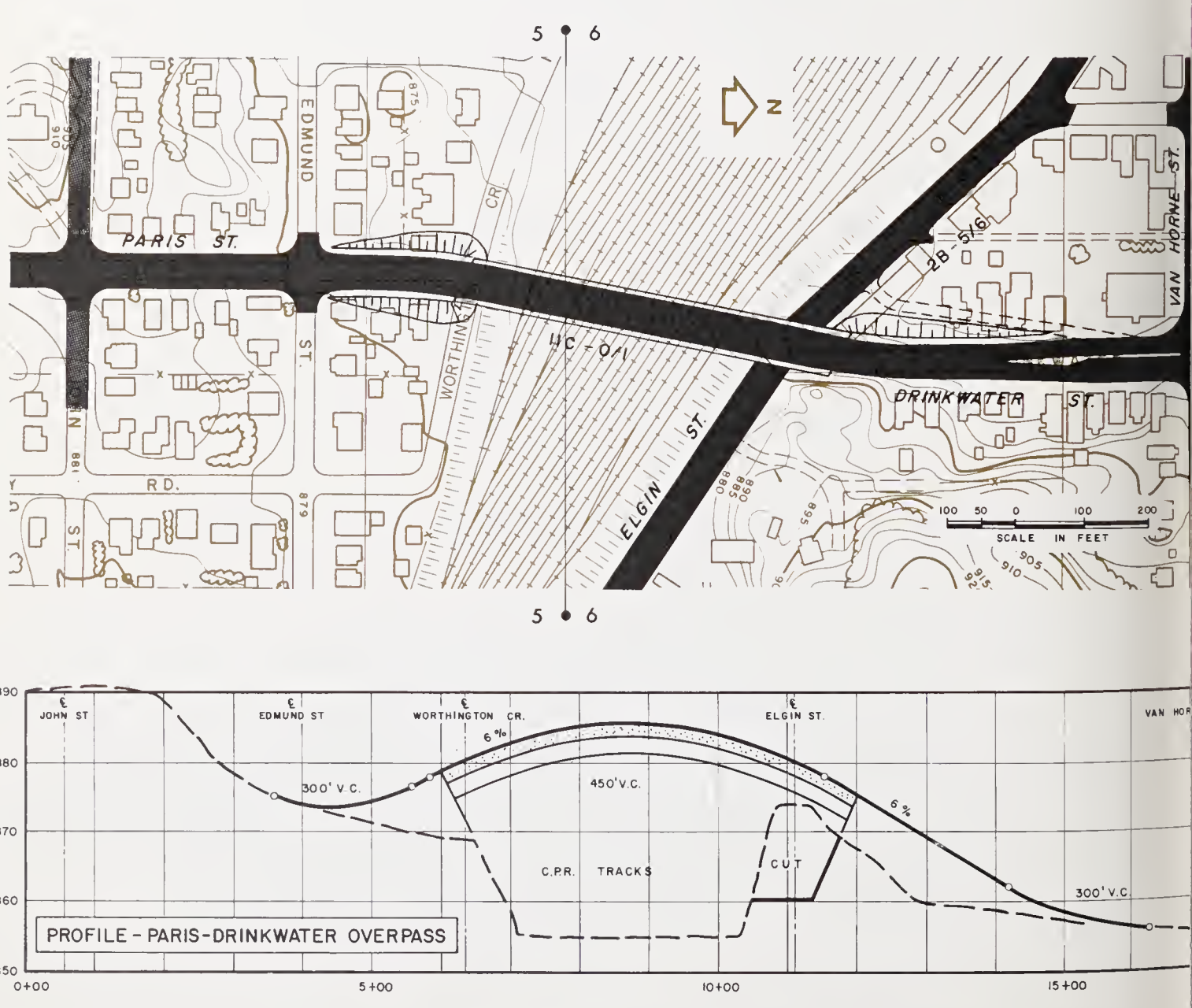
SECTION 5B-1 PINE STREET, BEECH STREET

From: Lorne St. (Exhibits 8.C,8.K
To: Notre Dame Ave. Grid Ref. 8E 7N)

It is proposed that a new underpass be constructed to connect Pine St. with Beech St. under the C.P.R. tracks and under Frood Road. In conjunction with this 4-lane facility, Beech St. should be provided with a 48 ft. wide pavement. The design of intersections on this section should be reviewed within the context of a downtown circulation plan.



PINE-BEECH CONNECTION (5B-1)



PARIS-DRINKWATER CONNECTION (11C-0/1)

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT

SECTION 5B-2/4 NOTRE DAME AVENUE

From: Beech St. (Exhibit 8.F
To: Kathleen St. Grid Ref. 8E 7N)

It is recommended that Notre Dame Avenue be widened and improved at an early date to provide for six lanes of traffic. This facility will require access control and the provision of turning lanes and a median, in order to accommodate anticipated traffic volumes. Additional widening should be provided on approaches to the major intersections at Beech/Notre Dame and Notre Dame/Kathleen, and consideration should also be given to the construction of left hand turn lanes where collector streets meet the major route.

SECTION 5B-4/5 NOTRE DAME AVENUE

From: Kathleen St. (Exhibit 8.F
To: Wilma St. Grid Ref. 8E 8N)

Four traffic lanes with a central median should be provided on this section,and some of the less important side streets should be closed. It is recommended that intersection improvements, with the provision of left hand turn lanes, be made at King St., at Dell St. and at Wilma St., and that approach widening should be provided at Kathleen St. All of this work is required at an early stage.

Every effort should be made through zoning bylaws, agreements or other means, to limit the number of driveways and access points serving fronting property on this street. Where feasible, access should be made from the rear of buildings and where driveways are essential their layout and geometric characteristics should be strictly controlled.

SECTION 5B-6/7 NOTRE DAME AVENUE

From: Wilma St. (Exhibit 8.A
To: La Salle Blvd. Grid Ref. 9E 10N)

This section has recently been reconstructed to provide four lanes with a median, and it is anticipated that this will be adequate for the duration of the planning period. However, any substantial increase in train movements at the C.N.R. crossing might require the provision of a grade separation immediately north of Wilma Street.

SECTION 5B-8/9 NOTRE DAME AVENUE, HIGHWAY 69

From: La Salle Blvd. (Exhibit 8.A
To: N. City Limits Grid Ref. 9E 11N)

It is anticipated that this highway will require widening to four lanes before the end of the planning period. The widening of that portion within the City Limits should be carried out to coincide with work undertaken beyond the City Limits.

****

SECTION 6B-0 FROOD ROAD

From: Elgin St. (Exhibit 8.E
To: Elm St. Grid Ref. 7E 6N)

A new connection between the south end of Frood Road and Elgin Street, utilizing the C.P.R. property, should be considered whenever the necessary land becomes available. No urgent need for this project was determined within the context of the transportation study, but it could nevertheless form an important part of the ultimate downtown circulation plan. It would be of particular interest if some redevelopment were to take place in this portion of the downtown area.

SECTION 6B-1 FROOD ROAD

From: Elm St. (Exhibit 8.E
To: College St. Grid Ref. 7E 7N)

It is recommended that this section of Frood Road be reconstructed when the Pine/Beech underpass is built, so that Frood Road is grade separated from the east-west movement. At this time, some improvement of the Frood/Elm intersection would be required to permit more movements at this location. The development of the Pine/Beech route,with consequent relief to Elm Street, and the prospective extension of Frood Road south of Elm Street would further increase the possibility, and indeed, the need for improvement of the Frood/Elm intersection. Improvements at the Lorne/Frood/College intersection should also be undertaken, and these should include the closing of the Fir Street approach which currently causes conflicts.

SECTION 6B-2/6 FROOD ROAD

From: College St. (Exhibits 8.A,8.E
To: Frood Mine Grid Ref. 7E 9N)

Frood Road will continue to be an important route and the principal connection to Frood Mine. As such, it should be maintained and upgraded by means of intersection improvements. The Alder/Kathleen route proposed elsewhere would overpass Frood Road, and interconnection between these routes would occur via Bloor and Lansdowne Streets, necessitating improvement to the Bloor/Frood and the Lansdowne/Frood intersections.

The Regent St. at-grade crossing of the C.P.R. should eventually be eliminated by the construction of a grade separated crossing at this location, or in the vicinity. The approaches to the intersection at Burton/Frood require some improvement to provide improved sight distances.

SECTION 6B-7/8 TURNER AVENUE

From: Frood Mine (Exhibit 8.A
To: Notre Dame Ave. Grid Ref. 8E 11N)

It is anticipated that the provision of a good paved two-lane roadway will be adequate to handle future traffic generated by Frood Mine.

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SECTION 7B-1 NEW ROUTE VIA AGNES

From: Notre Dame/Kathleen (Exhibits 8.A,8.F
To: Queen St. Grid Ref. 9E 8N)

It is intended that this section should form part of a new major arterial connection between Notre Dame Avenue and the New Sudbury area. Four lanes should be developed, with careful attention to the design and spacing of intersections.

SECTION 7B-2 NEW ROUTE SOUTH OF C.N.R.

From: Queen St. (Exhibit 8.A
To: Extended Attlee St. Grid Ref. 10E 9N)

This section would be built across previously undeveloped land, and may be developed in the first instance with two lanes (i.e. 24 ft. of pavement plus shoulders and ditches). Before the end of the planning period, this section will require four lanes: when these are constructed, an urban cross-section should be provided. Certain north-south routes will connect with this new route; e.g. a new collector street is proposed which would be approximately in line with Montrose Avenue, serving future development south of La Salle Boulevard; in addition, Attlee Street would be extended southward to meet the new route.

SECTION 7B-3 GEMMELL STREET

From: Extended Attlee St. (Exhibit 8.A
To: Barrydowne Rd. Grid Ref. 12E 9N)

This section of Gemmell Street should be widened and improved to carry four lanes of traffic, and provision should be made for curbs, gutters and sidewalks on both sides of the street.

At some future date it may be desirable to extend either Gemmell Street or Hawthorne Drive eastward to intersect with Falconbridge Road. The assignment of traffic to this route, however, was not sufficiently high to justify the inclusion of this proposal in the plan currently recommended.

****

SECTION 10B-1 ALDER STREET

From: Lorne St. (Exhibit 8.E
To: Ash St. Grid Ref. 7E 6N)

It is recommended that Alder Street be developed as an alternate to Regent Street between Lorne Street and Frood Road. The superior vertical alignment of Alder Street, combined with the possibilities for improved connections at both north and south ends, led to its adoption in preference to the Regent Street route. It would require pavement widening to 46 ft., sidewalks and intersection improvements at Alder/Lorne, Alder/Elm and Alder/Pine.

SECTION 10B-2 NEW ROUTE

From: Ash St. (Exhibit 8.L
To: Kathleen/College Grid Ref. 7E 7N)

It is proposed that Alder Street be connected to Kathleen Street by means of a viaduct which would overpass Nolin's Creek, the C.P.R. tracks and Frood Road. Certain modifications to the existing street pattern would be involved, as shown in Exhibit 8.L.

This extension of Alder Street to Kathleen Street provides an essential route by-passing the downtown area and serving the high demand for movement between the northeast and southwest areas of the City. The Alder Street extension is more logical than similar work would be on the Regent Street route, as property damage would be less, and a railway-roadway crossing would be avoided. (See discussion in Chapter 9)

SECTION 14C-3/4 KATHLEEN STREET

From: College St. (Exhibits 8.E,8.F
To: Notre Dame Ave. Grid Ref. 8E 8N)

This section should be improved to carry 4 lanes of arterial traffic, with additional widening in advance of the Kathleen/Notre Dame intersection. A jog elimination between MacKenzie Street and Melvin Avenue should be undertaken, together with curve improvements and adjustments to the vertical alignment on Kathleen Street itself.

****

SECTION 1C-1/5 REGENT STREET SOUTH AND NORTH

From: Lorne St. (Exhibit 8.E
To: Kathleen St. Grid Ref. 6E 7N)

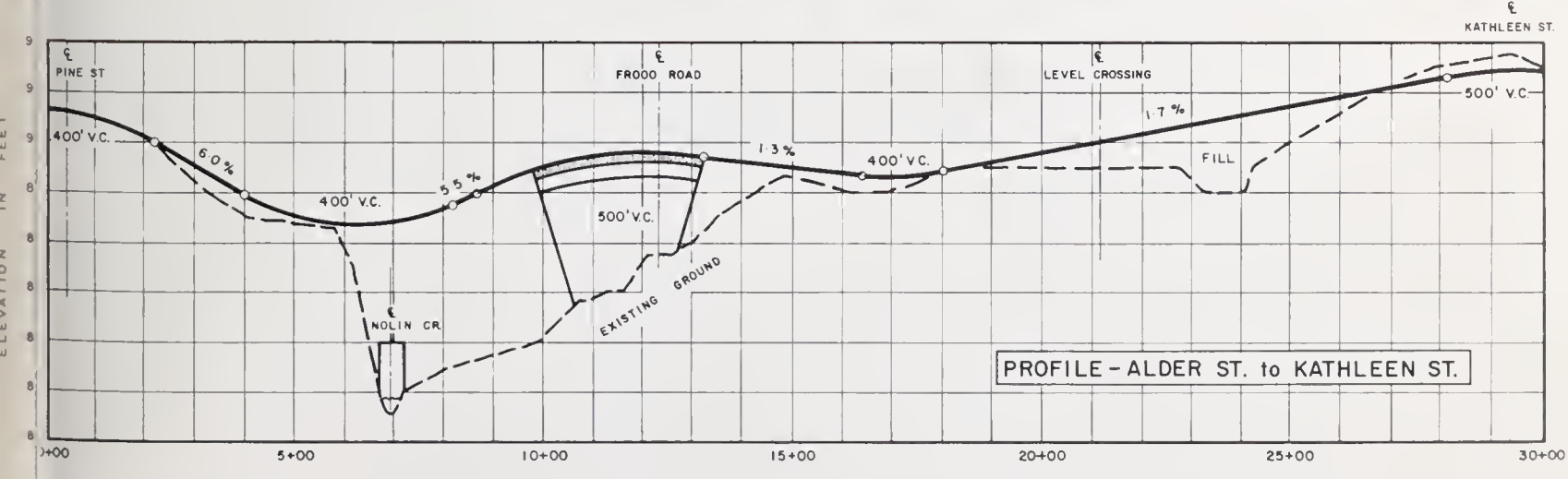
With the development of Alder Street as the major arterial route, it is anticipated that Regent Street would revert to the function of a collector or local street.

****

SECTION 2C-1/3 MARTINDALE ROAD

From: Regent St. South (Exhibit 8.A
To: Copper St. Grid Ref. 6E 3N)

The improvement of the Martindale/Regent/Walford intersection is described under Regent Street South (Route 2A). This section of roadway should be improved and widened to provide a 34 ft. wide pavement. There is also a need for sidewalks along this street.



UDBURY AREA
TRASPORTATION STUDY

DILLON

ALDER - KATHLEEN
NEW ROUTE (10B-2)

EXHIBIT 8-L

SECTION 2C-4 MARTINDALE ROAD

From: Copper St. (Exhibit 8.C
To: Lorne St. Grid Ref. 6E 4N)

It is recommended that the existing section between Copper St. and Lorne St. revert to a local street status, and that the existing at-grade crossing of the C.P.R. tracks be closed. Martindale Rd. would then be extended west of the Martindale Road public school across C.P.R. property, with an at-grade crossing of the C.P.R. tracks,and would intersect with Lorne St. at the Gutcher/Lorne intersection.

****

SECTION 3C-1/5 KELLEY LAKE ROAD, SOUTHVIEW DRIVE BOUCHARD STREET

From: Lorne St. (Exhibit 8.A
To: Regent St. Grid Ref. 5E 2N)

This section should be widened and otherwise improved to accommodate the moderate to heavy traffic it will handle in connection with the industrial area,and possible future development on Kelley Lake Road. In addition to these roadway improvements,considerable work is required at the C.P.R. at-grade crossing.

****

SECTION 4C-1/3 PARIS STREET

From: Regent St. (Exhibit 8.A
To: Walford Rd. Grid Ref. 7E 2N)

With the proposed improvement of the Regent St. South route, the traffic assigned to this section will not increase substantially. It is apparent, however, that widening and other improvements should be undertaken to bring it to City arterial street standards,and enable it to properly accommodate existing traffic.

SECTION 4C-4/9 PARIS STREET

From: Walford Rd. (Exhibits 8.A,8.D
To: John St. Grid Ref. 8E 4N)

This section will require four lanes during the 20-year planning period. Some realignment of the existing 2-lane facility will be warranted at an early date, particularly alongside Ramsey Lake, adjacent to the General Hospital,and at Facer Street.

SECTION 4C-10/11 JOHN STREET, NELSON STREET

From: Paris St. (Exhibit 8.D
To: Elgin/Morris/Lourdes Grid Ref. 8E 5N)

With the provision of a new overpass between Paris St. and Drinkwater St., this section of John St. and the existing Nelson St. Bridge will perform a less vital function in the street system. It is anticipated, however, that this will continue to be useful as a local or collector route.

SECTION 11C-0/1 PARIS STREET, DRINKWATER STREET

From: John St. (Exhibit 8.K
To: Van Horne St. Grid Ref. 8E 6N)

It is proposed that a new overpass be constructed between Paris and Drinkwater Streets over the C.P.R. yards. This new facility would provide four traffic lanes, and would be integrated with the existing street system and with the widened and extended Drinkwater Street. In connection with this work, it is proposed that the existing Elgin St. be depressed to underpass the new facility.

SECTION 11C-2 DRINKWATER STREET

From: Van Horne St. (Exhibit 8.H
To: Larch St. Grid Ref. 8E 6N)

This section would be widened to six lanes with suitable channelization to form part of the Brady/Drinkwater interchange referred to in Section 1T-2.

SECTION 11C-3 NEW ROAD, DRINKWATER STREET

From: Larch St. (Exhibit 8.D
To: Notre Dame/Beech Grid Ref. 8E 6N)

It is proposed that a major six-lane facility be constructed to connect the existing Drinkwater Street with the proposed new and improved facilities in the vicinity of Beech Street and Notre Dame Avenue. In conjunction with the road works involved in this project, some diversion of Junction Creek will be necessary, according to plans previously prepared. Intersection design and spacing will be a critical factor in the operation of this route, and the closure of Cedar Street would be desirable.

****

SECTION 5C-1 RAMSEY LAKE ROAD

From: Paris St. (Exhibit 8.A
To: Southbay Rd. Grid Ref. 9E 3N)

In connection with the development of Laurentian University, this section of roadway will require considerable realignment and improvement to serve adequately as a collector roadway. The design might well take advantage of the location along the shore of Ramsey Lake to provide an alignment of scenic significance.

SECTION 5C-2 RAMSEY LAKE ROAD

From: Southbay Rd. (Exhibit 8.A
To: End Grid Ref. 11E 4N)

At the present time, this section performs mainly a local service function for the sanitorium and for the summer and year-round residences on the south shore of Ramsey Lake. As and when more substantial residential development occurs in this area, some improvements of this roadway will be required.

****

SECTION 6C-1/2 YORK STREET

From: Regent St. (Exhibits 8.A,8.C
To: Paris St. Grid Ref. 7E 4N)

Normal maintenance with some minor improvements should be all that is required during the 20-year planning period.

The possibility of extending York Street westward to an intersection with Lorne Street is discussed under Route 5A-1 in Chapter 9.

****

SECTION 7C-1 ONTARIO STREET

From: McLeod St. (Exhibits 8.C,8.G
To: Regent St. Grid Ref. 6E 5N)

With the development of the Regent/Lorne/Brady interchange, and with the extension of McLeod Street across the C.P.R. to meet Lorne Street, this section of roadway would be detached from both McLeod and Regent Streets, and would thus revert to perform to a local service function.

****

SECTION 8C-1/2 RIVERSIDE DRIVE

From: Regent St. (Exhibit 8.G
To: End Grid Ref. 7E 5N)

With the development of the Regent/Lorne/Brady interchange, Riverside Drive would be detached from Regent Street. It should be incorporated into the collector street pattern of the Lakeview area (Wembley Drive, Edmund Street, etc.).

****

SECTION 9C-1 DOUGLAS STREET

From: Regent St. (Exhibit 8C
To: Brady St. Grid Ref. 7E 6N)

With the development of the Regent/Lorne/Brady interchange, and with the extension of Lorne Street to meet the Brady Street Throughway, Douglas Street would cease to be a feeder to Brady Street. It is proposed, therefore, that this section should be detached and revert to a local service function, providing access to the C.P.R. industrial area.

****

SECTION 10C-1 MINTO STREET

From: Elgin St. (Exhibits 8.D,8.H
To: Larch St. Grid Ref. 8E 6N)

With the proposed development of the Brady Street Throughway, Minto Street would become detached from Brady Street, and would cease to exist as a link in the downtown street pattern. A further usage of the street allowance would depend upon the requirements of the Arena and the new civic centre complex.

****

SECTION 11C-1 DRINKWATER STREET

From: Elgin St. (Exhibit 8.H
To: Larch St. Grid Ref. 8E 6N)

Proposals for Drinkwater Street are discussed in conjunction with those for Paris Street (Route 4.C)

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SECTION 12C-1 CEDAR STREET

From: Elgin St. (Exhibit 8.D
To: Carleton St. Grid Ref. 8E 6N)

The future status of this section will depend upon the ultimate circulation plan for the downtown area. It is possible that this street could become part of a one-way pair with Larch Street, but proposals for the development of a Drinkwater/Notre Dame connection indicate that the system would function better if Cedar Street were closed, and the Larch/Drinkwater intersection developed to handle all important turning movements.

****

SECTION 13C-1 LISGAR STREET

From: Larch St. (Exhibit 8.D
To: Beech St. Grid Ref. 8E 6N)

The status of Lisgar Street is governed mainly by the requirements for an ultimate downtown circulation plan. Indications are that Lisgar Street could become an important north-south collector route serving the downtown area.

****

SECTION 14C-1/2 KATHLEEN STREET

From: Frood Rd. (Exhibits 8E,8L
To: College St. Grid Ref. 7E 7N)

The development of the proposed new Alder/ Kathleen route would divert traffic away from this section of Kathleen Street, and its status would then depend upon the circulation plan for the Donovan area.

SECTION 14C-3/4 KATHLEEN STREET

From: College St. (Exhibits 8.E,8.F
To: Notre Dame Ave. Grid Ref. 8E 8N)

This section is described in conjunction with the Alder Street improvement and the proposed Alder/Kathleen connection under Route 10B.

****

SECTION 15C-1/2 BANCROFT DRIVE

From: Bellevue Ave. (Exhibit 8.A
To: Kingsway Grid Ref. 11E 7N)

Improvement of the Bancroft/Kingsway intersection is required, and this section should be maintained and improved to provide four lanes of pavement and adequate sidewalks. The horizontal alignment at Lonsdale Avenue should receive particular attention in any future work on this street.

****

SECTION 16C-1/3 SECOND AVENUE

From: Bancroft Dr. (Exhibit 8.A
To: Kingsway Grid Ref. 13E 7N)

The Second Avenue/Kingsway intersection requires improvement as referred to under Section 1A-22, and the roadway should be widened at least to collector street standards. It will be required to accommodate 4 lanes of arterial traffic near the end of the planning period.

****

SECTION 17C-1 MOONLIGHT AVENUE

From: Bancroft Dr. (Exhibit 8.A
To: Kingsway Grid Ref. 16E 6N)

This section should be paved and improved to collector street standards, with special attention being afforded visibility and grade at the Kingsway/ Moonlight intersection.

****

SECTION 18C-1/4 LA SALLE BOULEVARD

From: Notre Dame Ave. (Exhibit 8.A
To: Barrydowne Rd. Grid Ref. 10E 11N)

This section should be widened and improved to provide 4 lanes, with associated work including storm sewers; sidewalks, etc., and medians and turning lanes (i.e. channelization) in the vicinity of the New Sudbury Shopping Centre and the La Salle/Barrydowne intersection.

SECTION 18C-5/6 LA SALLE BOULEVARD

From: Barrydowne Rd. (Exhibit 8.A
To: Falconbridge Rd. Grid Ref. 14E 11N)

This section should be widened and improved to provide 4 lanes, with associated work including storm sewers, sidewalks, etc., and channelization in the vicinity of Falcon Plaza and the La Salle/Falconbridge intersection.

SECTION 18C-7/8 LA SALLE BOULEVARD

From: Falconbridge Rd. (Exhibit 8.A
To: C.N.R. Station Grid Ref. 16E 11N)

Some improvements to this section of roadway may be required if residential and industrial development in this area, coupled with increased usage of the C.N.R. Station, should give rise to substantial traffic growth. The poor vertical alignment east of Elisabella Street warrants some improvement at an early date.

****

SECTION 19C-1 NORTHWAY AVENUE

From: La Salle Blvd. (Exhibit 8.A
To: End Grid Ref. 10E 11N)

This street is too short to provide an adequate collector function in this area,and it is recommended that it revert to a local street classification. Consequently, Rideau Street and Montrose Avenue should be developed to provide collector service.

****

SECTION 20C-1/2 BARRYDOWNE ROAD

From: Kingsway (Exhibit 8.A
To: La Salle Blvd. Grid Ref. 13E 9N)

This section requires widening to 4 lanes at an early date, with channelization provided at the Barrydowne/La Salle intersection, adjacent to the New Sudbury Shopping Centre, and at the intersection with the proposed new east/west arterial route (i.e. at Gemmell Street).

SECTION 20C-3 BARRYDOWNE ROAD

From: La Salle Blvd. (Exhibit 8.A
To: Woodbine Ave. Grid Ref. 13E 11N)

This section will require widening before the end of the 20-year planning period.

SECTION 20C-4 BARRYDOWNE ROAD, MALEY DRIVE

The future of this section will depend upon development around the present urban area boundaries, and beyond the existing City Limits.

****

SECTION 21C-1 LANSING AVENUE

From: La Salle Blvd. (Exhibit 8.A
To: Madison Ave. Grid Ref. 14E 11N)

This route may form part of the future collector system serving the New Sudbury area. In that event, it should be constructed to collector street standards.

****

DISCUSSION OF MISCELLANEOUS NEIGHBOURHOOD STREET REQUIREMENTS

NEIGHBOURHOOD 1 PIKE LAKE

S. of Ramsey Lake (Exhibit 8.A
N. and E. of Nepahwin Lake Grid Ref. 11E 5N)

The portion of Ramsey Lake Road between Paris Street and the new Laurentian University campus should be brought to collector street standards at an early date (see Route 5C). The balance of Ramsey Lake Road, together with Southbay Road and Kirkwood Drive will require some improvement and widening, as and when the area develops more fully. The scenic possibilities in the Pike Lake area should be considered, and incorporated as a feature in any roadway design.

NEIGHBOURHOODS 2 & 3 LOCKERBY EAST

E. of Regent St. South (Exhibit 8.A
S. of Ramsey Creek Grid Ref. 7E 3N)

Loach's Road will require some widening and improvement. Intersection improvements at Loach's/Highway 69 are included under Route 2A. If Loach's Road is extended north eastward to serve Laurentian University, additional improvements and widening will be required. Walford Road will require general maintenance, and the Walford/Martindale/Regent and Walford/Paris intersections will require widening, channelization and other improvements as mentioned earlier.

NEIGHBOURHOODS 4 & 5 LOCKERBY WEST

W. of Regent St. South (Exhibit 8.A
S. of Lorne St. West Grid Ref. 6E 2N)

The major collector street in this area will be Martindale Road, which will function in conjunction with Charlotte Street. The extension of Martindale Road to the Lorne/Gutcher intersection and the improvement of the Martindale/Regent/Walford intersection are discussed under Routes 1A and 2A respectively. Kelley Lake Road, Southview Drive and Bouchard Street have been discussed under Route 3C. These streets will continue to provide service to the immediate area, but should be improved to arterial standards to accommodate traffic movements generated by the adjacent industrial area.

NEIGHBOURHOODS 6 & 7 LAKEVIEW, KINGSMOUNT

N. of Ramsey Creek (Exhibits 8.C,8.D
S. of C.P.R. facilities Grid Ref. 7E 5N)
E. of Regent St. South

York Street, Hyland Drive, Wembley Drive, Edmund Street etc. currently provide collector street service. It is proposed that Riverside Drive be diverted in conjunction with the Lorne/Regent interchange construction (1T-1) to serve as an additional collector street. Also, John Street should be connected with Marion Street, west of Paris Street, and the entire route developed to collector street standards.

NEIGHBOURHOOD 8 GATCHELL

N. of Lorne St. West (Exhibit 8.A
W. of Byng Ave. Grid Ref. 5E 4N)

Access to this area should be concentrated at designated intersections along Lorne Street, including the proposed Lorne/Gutcher/Martindale intersection. Selected collector streets should be physically improved and controlled with traffic signals at their intersections with Lorne Street South: this will enable local streets north of Lorne Street South to be closed.

NEIGHBOURHOODS 9, 10, 11 & 12 WEST END

N. of Lorne St. West (Exhibits 8.C,8.E
S. of C.P.R. Tracks Grid Ref. 6E 6N)

It is proposed that Elm Street, Alder Street and Pine Street should become arterial streets in this area, and that Spruce Street and Regent Street should revert to perform collector or local service functions. With the development of the proposed Lorne/Byng/McLeod intersection, Byng Avenue would become a collector. Some improvements to the existing collector streets, including Victoria Street, Simcoe Street, McNeill Boulevard and Ethelbert Street, are needed to bring them to City standards.

NEIGHBOURHOODS 13, 14 & 15 — DONOVAN

N. of C.P.R. and Beech St.
W. of Notre Dame Ave.
(Exhibits 8.E,8.F Grid Ref. 7E 8N)

Construction of the Alder/Kathleen route will make necessary certain revisions to the collector street pattern in this area. The MacKenzie/Melvin route and the College/Eva route will require intersection improvements at Kathleen Street. A jog elimination at the Bessie/Kathleen intersection is warranted, together with a general up-grading of the entire collector system.

NEIGHBOURHOOD 16 — FLOUR MILL

E. of Notre Dame Ave.
N. of Louis St.
S. of C.N.R. Tracks
(Exhibit 8.E Grid Ref. 9E 8N)

This area is poorly served with collector streets at the present time, and certain arterial route proposals would further restrict access. It is proposed, therefore, that Clinton Street be established as the basis of a collector system by extending it northward to the Notre Dame/Wilma intersection, and by developing an adequate intersection with the new east-west (Kathleen) route. General improvements in the area south of the new east-west route, including a new connection across Junction Creek, are also warranted.

NEIGHBOURHOODS 17 & 18 — NORTHERN HEIGHTS

E. of Frood Rd.
W. of Notre Dame Ave.
N. of Donovan Area
(Exhibit 8.A Grid Ref. 7E 9N)

Much of the development here is comparatively recent, and collector streets are generally adequate. However, some minor improvements are warranted (e.g. sight distances at Snowdon/Dell intersection), along with routine maintenance.

NEIGHBOURHOODS 19, 20 & 21 — NEW SUDBURY WEST

N. of C.N.R.
E. of Notre Dame Ave.
W. of Barrydowne Ave. and Shopping Centre
(Exhibit 8.A Grid Ref. 11E 11N)

None of the streets in this area currently function as collectors, in spite of the fact that some have been so designated. As this area develops, collector streets should be planned which will intersect with arterial streets at appropriate intervals, and which will serve to carry traffic from the local streets safely and speedily to the arterial facilities. The designation of collector streets should enable certain local streets to be closed at La Salle Boulevard, thus greatly improving traffic flow characteristics on that major route.

NEIGHBOURHOODS 22 & 23 — NEW SUDBURY EAST

N. of La Salle Blvd.
E. of Barrydowne Ave

(Exhibit 8.A
Grid Ref. 15E 11N)

As the population of this area grows, streets should be selected and developed to provide a collector service as mentioned above in connection with New Sudbury West.

NEIGHBOURHOODS 24 & 25 — NEW SUDBURY SOUTH

S. of C.N.R.

(Exhibit 8.A
Grid Ref. 13E 9N)

The construction of a new route from Kathleen/Notre Dame (Route 7B) will have a substantial impact upon this area, and the collector street system should be adequate to serve this new facility. As development occurs eastward towards Falconbridge Road, one or more properly placed collector street connections should be provided to give adequate access to this arterial facility.

NEIGHBOURHOODS 26, 27 & 28 — HOWEY, KINGSWAY

E. of Downtown

(Exhibit 8.A
Grid Ref. 10E 6N)

Van Horne Street is a moderately important collector serving this area, and some effort should be made to improve the route. Much of the development in this area is "ribbon" development along Kingsway, Morris Street and Howey Drive, and appropriate collector streets cannot be readily delineated.

NEIGHBOURHOODS 29, 30 & 31 — MINNOW LAKE WEST

E. of Somerset St.
W. of First Ave.

(Exhibit 8.A
Grid Ref. 12E 7N)

The pattern of development around Minnow Lake does not permit the meaningful designation of a collector street system, but every effort should be made to ensure that future subdivision in this area is coordinated with a plan for local and collector streets.

NEIGHBOURHOODS 32, 33 & 34 — MINNOW LAKE EAST MOONLIGHT

E. of First Ave.

(Exhibit 8.A
Grid Ref. 15E 6N)

Second Avenue currently serves this area as a collector, but will develop an arterial function as development progresses. Moonlight Avenue should be developed to collector street standards, and a new collector route will be required as and when residential development is intensified on the north shore of Ramsey Lake.

THE DOWNTOWN AREA

(Exhibits 8.D,8.E
Grid Ref. 8E 6N)

The designation of a major street system, including arterial and collector streets, is an exercise of dubious merit when applied to the downtown area, because the characteristics of land use and the historical development of roadways are not compatible with functional street classifications mentioned previously. Furthermore, the intensity of existing and future development in downtown indicates the need for detailed and integrated design to relate buildings, parking facilities and pedestrian ways with streets for vehicular access and vehicular circulation: these detailed considerations are beyond the scope of the present study.

Based upon the analysis to this point, a number of recommendations have been made which provide a framework for the downtown street pattern.

Access to downtown would be via:

- Frood Road
- MacKenzie Street
- Notre Dame Avenue
- Lloyd Street/Elm Street East
- Carleton Street
- Van Horne Street
- Elgin Street South
- The new Paris-Drinkwater connection over the C.P.R. Yards
- Brady Street
- Elm Street West
- The New Pine-Beech connection under the C.P.R. tracks

The proposed extension of Brady Street easterly from Drinkwater Street will provide a through connection for traffic not wishing access to or from downtown.

Distribution in and around the downtown area will be via:

- The extended Beech Street (or some equivalent facility)
- The new Drinkwater - Notre Dame connection
- Elgin Street (including the possible Elgin-Frood connection)
- Larch and Carleton Streets
- Lisgar Street

These facilities are indicated on Exhibit 8.B, which shows route capacities and traffic assignments.

In order to prepare comprehensive and integrated plans for land use and street development in the downtown area, it is apparent that further and more detailed work will have to be undertaken. This would involve the Sudbury Planning Board, the Parking Authority and various City Departments. In addition, it is possible that recourse will have to be made to consultants in specialized fields such as economics, transportation or civic design.

CHAPTER 9

ALTERNATIVES TO THE RECOMMENDED PLAN

9.1 DISCUSSION OF ALTERNATIVES

It is possible to envisage many transportation networks and combinations of projects which could feasibly serve the present or future needs of Sudbury. These would range from hypothetical and idealistic systems derived entirely from theoretical concepts to practical projects having many minor variations. It would be quite impossible to study more than a small selection of these within the context of this report,and every effort has been made to explore those proposals which seemed practical within the topographic limitations of the area; financially feasible, compatible with existing facilities and appropriate for future requirements.

Selected proposals from other reports which predate this work are discussed in Chapter 7; Chapter 8 outlines the Recommended Plan, and the present Chapter will discuss those projects and route alignments which appear to warrant further investigation and consideration as alternatives to the recommended plan.

ROUTE 2T-1 BRADY STREET EXTENSION

From: Drinkwater Street (Exhibit 9.A
To: Kingsway/Falconbridge Grid Ref. 11E 7N)

The recommended plan for the extension of Brady Street east of Drinkwater Street proposes a relatively short connection to Kingsway/Argyle. Also, the recommended plan proposes that relief to the Kingsway corridor and to the Notre Dame Avenue-La Salle Boulevard route should be provided by the construction of a new route (7.B) from the Notre Dame/Kathleen intersection to Gemmell Street and Barrydowne Road.

The "Highway 17 Connecting Link Report (1959)" proposed the extension of Brady Street to the Kingsway/Bancroft intersection but for the reasons discussed in Chapter 7 (Route 3T-1) the present study recommends against this proposal as it offers only partial relief to the Kingsway corridor.

As an alternative to the above proposals a study was made to evaluate a route which would extend Brady Street eastward from Drinkwater Street to the Kingsway/Falconbridge Road intersection (see Exhibit 9.A). This project would represent a modification of the scheme proposed in the "Highway 17 Connecting Link report (1959)" and is very similar to the "alternative route" shown in the "Amendment to the Official Plan (1961)" (see references in Chapter 2. Section 2.5).

Since the route between Drinkwater and Kingsway/Falconbridge would be across high rocky ground, somewhat remote from existing or proposed

development,it would be easy and logical to build it as a fully grade-separated and controlled access facility along the whole length. The proposal was dubbed "the throughway" by local people some time ago and there is every reason to suppose that, if it were to be constructed, it would have expressway characteristics and 50 m.p.h. design standards.

An alignment has been developed which would carry Brady Street through the rock outcrop east of Drinkwater Street, thence across rocky undeveloped land over Bancroft Drive and across more rock to the existing Kingsway/Falconbridge intersection. Provision would be made for selected interchange movements at Bancroft Drive, and at Howey Drive in the neighbourhood of Wessex Street.

From the structural and economic points of view the construction of this road would be straightforward, involving a moderate amount of cut and fill in rock, with one structure to overpass Bancroft Drive and possibly another to accommodate interchange movements with Howey Drive. The costs would be less than $3 million,which is normal for the two and one half mile length considering the terrain.

With the proposed alignment, this route would serve substantially the same trips as are now accommodated by the Kingsway. Through trips form a modest proportion of this movement, and the desire line diagrams indicate that the major portion of the traffic served would be that between the New Sudbury area and Sudbury's Central Business District.

The route would lie a little south of the major axis of travel desire (see Exhibits 6.D and 6.E),but if developed to a high standard of geometric design,it would attract traffic amounting to 24,000 trips per day (see Exhibit 9.B).

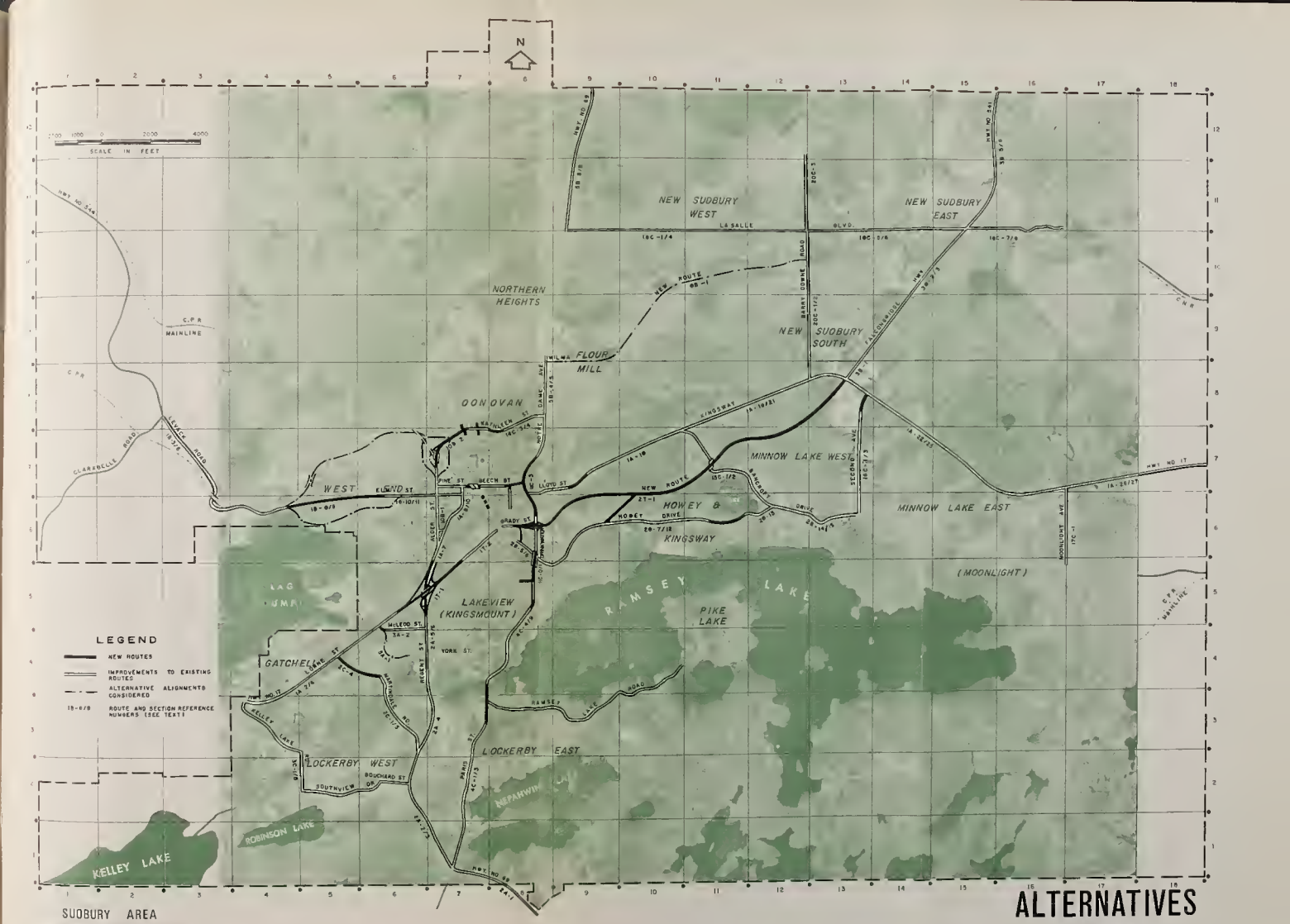
After the engineering feasibility and service properties of the route had been generally evaluated, it was decided to test the route as part of Sudbury's major street network by assignment of 1985 trips to the network described as "The Alternate Plan",and shown in Exhibit 9.B

The analysis of assigned traffic volumes revealed a number of factors:

- much of the route would operate considerably below capacity (an assigned volume of 24,000 vehicles per day compared with a theoretical capacity of 54,000 vehicles per day)

- although the ROUTE would operate well below its theoretical capacity it would be very difficult or impossible to develop adequate INTERCHANGE capacity to handle the required trip transfer and turning movements.

As will be seen from the Recommended Plan and associated commentary, one of the chief purposes of that network, as it affects downtown, is the distribution of traffic loads onto as many streets as possible,while at the same time by-passing as many as possible of the non-destined or through trips.

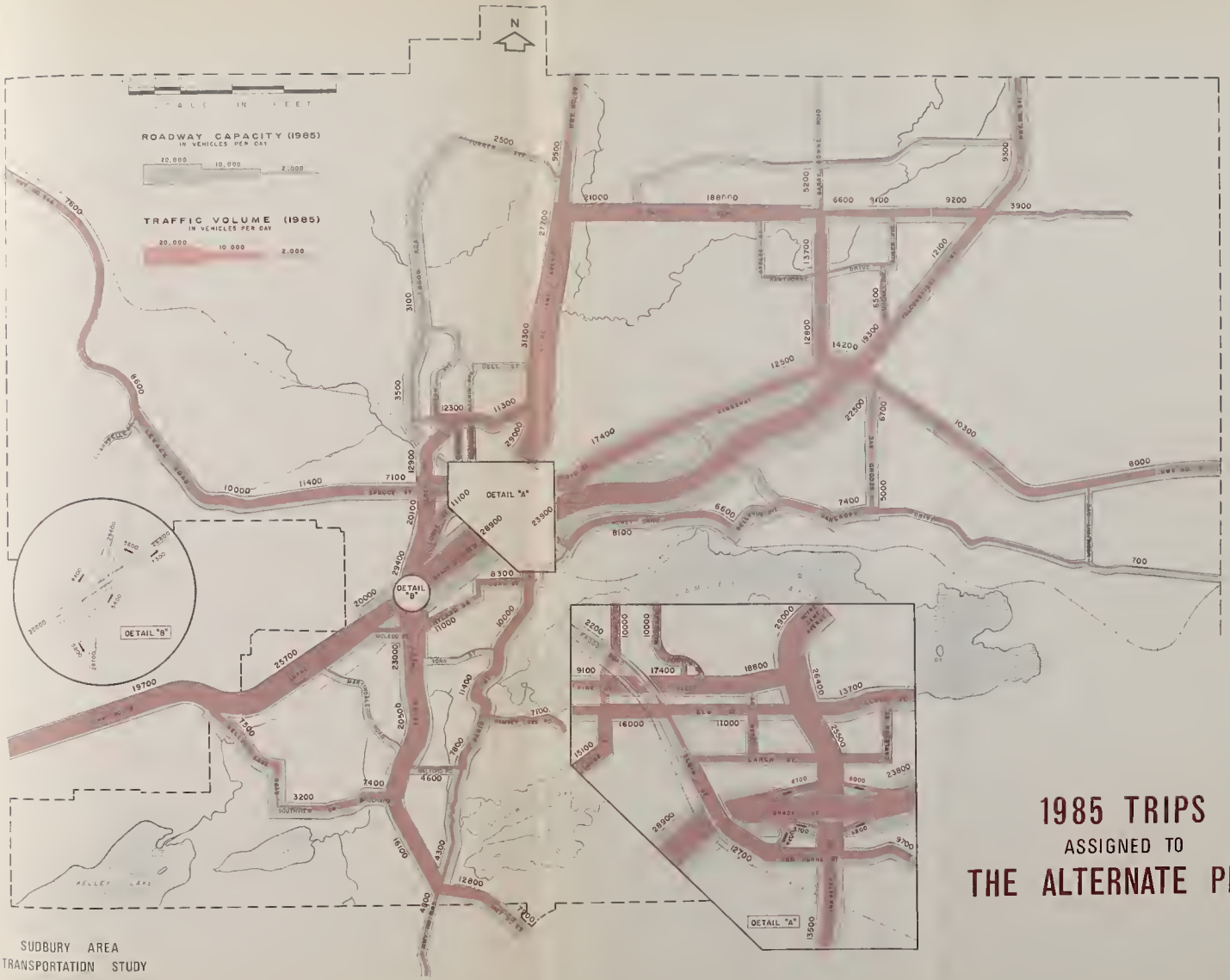


SUDBURY AREA TRANSPORTATION STUDY

DILLON

ALTERNATIVES to the RECOMMENDED PLAN

EXHIBIT 9-A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SCALE IN FEET
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1985 TRIPS
ASSIGNED TO
THE ALTERNATE PLAN
SUDBURY AREA
TRANSPORTATION STUDY
DILLON

EXHIBIT 9-B

Present entry points are Brady and Lorne Streets from the south and west, Elm Street from the west, Frood, College, MacKenzie and Notre Dame Avenue from the north, Lloyd and Van Horne Streets from the east and Elgin Street from the south. The Recommended Plan would add the Pine-Beech connection from the south, and at the same time would increase the capacities on Brady Street, Notre Dame Avenue and Lloyd Street. The addition of a high capacity route from the east would contribute substantially to the system PROVIDED THAT ADEQUATE INTERCHANGE CAPACITY WITH THE DOWNTOWN CIRCULATION SYSTEM COULD BE PROVIDED.

The only north/south streets in downtown to which the Brady Street Throughway facility could connect are Elgin, Minto and Drinkwater Streets. Elgin and Minto Streets are not well placed to give good access to parking facilities and the downtown area generally, and indeed, it is proposed that Minto Street be closed to traffic. Drinkwater Street should be developed as a major 6-lane arterial street, but much of the available capacity both here and on Elgin Street would be taken up with traffic from the south and west. It would be highly costly to provide ramps to and from the east to connect with Drinkwater Street, and once provided, their capacity would be quite restricted by the conflicts of movement, making it virtually impossible to develop the full potential of the east/west route. If there were no capacity restrictions at Drinkwater, virtually all the Kingsway traffic would transfer to the throughway. The fact that Exhibit 9.B shows some 12,000 to 17,000 trips continuing to use Kingsway reflects manual adjustments to the assignment which were carried out to indicate a more realistic distribution of traffic between the two facilities.

- comparison of Exhibits 8.B and 9.B shows that, while Kingsway would be less heavily traveled and would, therefore, require only 4 lanes under the alternative plan compared with 6 lanes under the recommended plan, Notre Dame Avenue. La Salle Boulevard, Barrydowne Road and Falconbridge Road would all be more heavily loaded under the alternative plan.

- Interchange ramps at Howey Drive and Bancroft Drive would not serve major movements. Usage, therefore, would be light.

- If the facility were to be installed and operated satisfactorily, it is likely that traffic at the Kingsway/Falconbridge intersection would soon require the development of a grade-separated interchange, which would further increase the project cost.

In addition to the above traffic conditions, it is apparent that this route would serve no valuable land service function. As an expressway it would not, of course, be expected to serve fronting property directly, but in favourable circumstances an expressway facility with

appropriate connections can prove beneficial to the development of nearby land. As said before, however, the terrain through which this route runs is not conducive to development; hence, such side benefits are of no importance in the consideration of the route.

In view of all the above factors, the extension of Brady Street to the Kingsway/Falconbridge intersection was deemed to have less merit than the proposals put forward in the recommended plan.

ROUTE 5A-1 YORK STREET EXTENSION

From: Lorne/Byng (Exhibit 9.A
To: Regent Street South Grid Ref. 6E 4N)

Preliminary designs for the Regent-Lorne-Brady interchange do not accommodate the north to west and east to south traffic movements between Regent Street and Lorne Street. Although some of the longer trips wishing to make these movements can take place via Kelley Lake Road and Martindale Road, a study of the desire line diagrams shows that some further provision should be made in the vicinity of the interchange.

Many of the above trips currently take place on McLeod Street,which is suitably signed as a highway route,and the recommended plan proposes the improvement of McLeod with a new grade crossing,and street widening.

As an alternative to the McLeod connection, the extension of York Street appears logical, in that this would provide continuity of the connection from Lorne Street to Regent Street and east to Paris Street,and would offer greater amenity to the Lockerby community, together with some relief of Regent Street north of York Street.

Investigation of three possible alignments revealed a number of problems in the York Street extension proposal,however, including steep grades on the approaches to Junction Creek, the need for a new bridge or culvert, the need to acquire more than thirty properties,and the awkward intersectional problems created at Charlotte Street.

For these reasons the choice of McLeod Street as the recommended route was confirmed.

SECTION 1B-6/9 LEVACK ROAD
SPRUCE STREET
ELM STREET WEST

From: Fisher Plant (Exhibit 9.A
To: Elm/Albinson Grid Ref. 5E 6N)

In accordance with the Recommended Plan,Alder Street would be developed as a major north-south arterial,and improvements would be undertaken on Levack Road to accommodate existing and projected traffic between Clarabelle Road and Alder Street.

West of the Fisher Plant, route improvement can be achieved by means of rock excavation for improved alignment, reconstruction of the C.P.R. underpass and other engineering works not involving major property acquisition. When this road enters the developed area of the City, however, the gridiron street pattern, alignment and grade factors and the discontinuity of Spruce Street between Regent and Alder Streets all give rise to difficulties involving design and property acquisition.

When studying the possible alignments for a major east-west route in this area, it became apparent that the existing Elm Street right-of-way should be used between Albinson Street and Alder Street, thereby avoiding the problem of continuing Spruce Street west of Regent Street, and providing suitable intersections at Spruce/Alder and Spruce/Lorne.

To provide a connection from Levack Road to the Elm/Albinson intersection two possible alignments were considered:

(i) Using the existing alignments of Levack Road and Spruce Street to the Spruce/Horobin intersection, thence developing a new diagonal roadway connecting Spruce/Horobin to Elm/Albinson.

(ii) Developing a new section of Levack Road eastward from the Fisher Plant and north of the present roadway, through a rock cut to connect with Elm Street at the Elm/Simcoe intersection, and thence easterly on Elm Street to Albinson Street.

Of these two proposals the one involving the rock cut (ii) would be the more expensive to construct, but it would avoid any developed residential property and would result in a better roadway alignment, offering better service both to the Levack Road traffic and to the adjacent residential areas. This proposal was therefore adopted for the Recommended Plan.

In connection with this project, some additional study was directed toward the possible development of a new alignment for Levack Road north of the C.P.R. Such a route would enter the City in the neighbourhood of McKim Street, and would continue eastward to Beatty Street and underpass the C.P.R. main line to join Frood Road. The advantage of such a proposal would be the improvement of access to the neighbourhood around Beatty and McKim Streets, and the utilization of spare capacity on Frood Road. However, the expense of the new roadway, and complications involving the C.P.R. main line near Beatty Street indicated that such a route could not be justified within the 20-year traffic planning period encompassed by the present study.

ROUTE 8B-1 NEW ROUTE

From: Notre Dame/Wilma (Exhibit 9.A
To: Barrydowne N. of C.N.R. Grid Ref. 11E 9N)

Having concluded, from the above discussions of Route 2T-1, that a new route connecting Notre Dame and Barrydowne Avenues would be valuable, two alignments were considered for feasibility and desirable traffic service.

A route alignment from the Notre Dame/Kathleen intersection to Gemmell Street (Route 7B) was developed, and was subsequently incorporated as part of the Recommended Plan as discussed in Chapter 8.

An alternative route alignment was developed from the Notre Dame/Wilma intersection to run north of the C.N.R. tracks and intersect with Barrydowne Road just south of the New Sudbury Shopping Centre (see Exhibit 9.A).

A comparative analysis of these two projects indicated a number of factors affecting the route selection:

- the route 7B from Notre Dame/Kathleen provides continuity with the recommendation to develop the Alder-Kathleen route (10B).

- while the route 8B from Notre Dame/Wilma could be connected to a new route west of Notre Dame (i.e. by extension of Morin Avenue north and south) such a proposal would have repercussions on the collector street system in the Donovan area, and close proximity to the C.N.R. tracks would give rise to problems of the kind already besetting Sudbury (see Chapter 3, Section 3.8).

- the effect of constructing a new major arterial route through the Flour Mill area was considered. Improvements to the street system in this area are certainly needed, and the extension of Kathleen Street would seem to be a convenient means of achieving these.

- east of Notre Dame Avenue, a route placed north of the C.N.R. line would tend to reinforce the barrier effect produced by the railway and Junction Creek. Placed south of the C.N.R., the recommended route 7B would open up undeveloped land between the railway and the high rocky area north of the Kingsway.

- while no direct assignment of traffic has been made to Route 8B, consideration of the traffic volumes assigned to Notre Dame Avenue and to Route 7B gives some indication of the effects to be anticipated. The Route 8B north of the C.N.R., if it were constructed, would increase the traffic load on that portion of Notre Dame Avenue between Kathleen Street and Wilma Street. Hence, additional widening on Notre Dame Avenue would be required to accommodate 6 lanes of traffic, and this would be both difficult and costly to achieve.

- Either route would require at least one crossing of the C.N.R. tracks, but the northerly route would involve two additional crossings of Junction Creek.

  After due consideration of the above factors, it was concluded that new route from Notre Dame/ Kathleen (Route 7B) was the more desirable of the proposals studied.

SECTION 10B-2 NEW ROUTE

From: Alder/Ash (Exhibit 9.A
To: Kathleen/College Grid Ref. 7E 7N)

Studies of the existing traffic problems (Chapter 3) and analysis of the existing and future desire line patterns (Chapter 6) indicated the desirability of providing a new route north and west of the down-town area. A minor connection currently exists between Regent Street and Kathleen Street, but Regent Street would be difficult and expensive to improve due to the several steep gradients along its length. It became apparent, therefore, that Alder Street, if it could be suitably improved and extended north-eastward to intersect Kathleen Street, would provide the basis for the type of facility envisaged.

During the development of the recommended plan four possible alignments were studied:

(i) Northerly projection of Alder Street to overpass Nolin Creek, the C.P.R. and Frood Road, thence east from Bessie Street alongside the C.N.R. tracks to meet Kathleen Street.

(ii) North-easterly projection of Alder Street over Nolin Creek, the C.P.R. and Frood Road, thence north of Lansdowne Avenue to meet Kathleen Street.

(iii) North-westerly projection of Alder Street crossing Nolin Creek and thence northerly underpassing the C.P.R. and Frood Road. west of Bessie Street and alongside the C.N.R. tracks to Kathleen Street.

(iv) Continuation of Alder Street on its present right-of-way south of Nolin Creek to intersect with Regent Street, thence north on Regent Street to underpass the C.P.R. tracks and Frood Road, thence east on Bloor Street to College Street.

An assignment of 1985 traffic was made to the street network including the Alder/Kathleen connection, and it became apparent that a 4-lane facility would be required.

The Proposal (iv) did not seem suitable for development as a 4-lane facility. Indeed it would seem to be incapable of serving the same volume of traffic or of assuming the same functional characteristics as the other projects. Hence, this was designated as the least suitable route to perform an arterial function, although its development to serve as a local or collector street might be valuable.

Proposal (ii), using Lansdowne Avenue, would separate the public school and certain residential properties from the balance of the neighbourhood. It would form a considerable barrier, would be difficult to connect with Frood Road and would be undesirable from the standpoint of amenity.

Proposal (iii), underpassing the C.P.R. tracks would involve very long steep grades and considerable cut on the north side, together with some track relocation. Any local street connections would be difficult to make. The excavation quantities involved would be formidable, particularly on the north side of the Creek.

Thus, by a process of elimination it was determined that, of the various alternatives, the proposal (i) had the most merit from the construction, traffic service and aesthetic standpoints. This, therefore, was the route incorporated into the Recommended Plan.

It is not clear at this stage whether the establishment of the new route would permit the closure of the existing at-grade crossing at Regent/Frood/Kathleen. A detailed design study should be instituted, in order to determine the access and circulation needs of the adjacent areas, north-west of the crossing. It is possible that such a study will reveal a need for an additional grade separation north of the recommended route, to serve local neighbourhood needs.

9.2 THE STATUS OF ALTERNATIVES

As explained at the beginning of Chapter 8, this study has developed a recommended street network in sufficient detail to show what work is required and approximately how much money will need to be spent over the 20-year period (see Chapter 10). While justification for the various proposals has been developed and presented, the precise location and design of each item cannot properly proceed until the network has been adopted. When the broad outline of the street network has received acceptance, then a more precise study of individual routes and proposals can be undertaken.

At that stage, some of the alternative projects mentioned above may replace elements of the recommended plan, and further alternative projects may be developed and examined in accordance with changes in development patterns and traffic volumes and found to be more desirable. It is not feasible, at the present stage to examine in depth all the possible alternatives to a given proposal.

As far as it can be currently determined, however, the projects presented and discussed as part of the Recommended Plan (Chapter 8) generally represent the most desirable system for the accommodation of anticipated traffic needs over the coming 20-year period.

CHAPTER 10

STAGING AND FINANCIAL REQUIREMENTS

10.1 CLASSIFICATION OF STREETS IN THE RECOMMENDED PLAN

Chapter 8 was a summary of the various projects which form the recommended roadway network for 1985. Exhibit 10.A shows this same 1985 network with the various elements classified according to their anticipated function: this exhibit should serve to reinforce previous statements that all the projects proposed are mutually interdependent within the network. Traffic from the neighbourhoods is fed by local streets onto collector streets which, in turn, feed the arterial system, while conversely, trips on the arterial streets are distributed to their destinations through the collector and local networks. A collector street cannot function unless it intersects the local streets that will feed traffic onto it: furthermore, there is little point in building an arterial street unless the capacities of collector streets and intersections are adequate to load and unload it. Similarly, the value of an expressway or throughway is entirely dependent upon the capacity of its junctions, and upon the capacities of the arterials which interchange with it. In effect then, the network of transportation facilities must be developed and expanded as a system, in which all elements will function in concert.

10.2 CONSIDERATIONS IN STAGING OF CONSTRUCTION

A transportation system is not an item that can be bought and installed as a package, and then operated smoothly throughout its working life. Each element of the system requires much time, effort and money to develop, and as soon as one element is in operation, another requires attention. Furthermore, the transportation system must serve a changing and growing area, and therefore, the requirements of the community must be constantly reviewed and the plan adjusted to satisfy emerging trends. Thus, it is the task of the City, having determined future goals and objectives, to program their efforts according to several criteria, including the following:

- each project must contribute functionally toward the ultimate network of classified streets according to the Recommended Plan.

- each project should become functional as soon as possible after it is completed, in order to make maximum use of the time and money invested. This can only be achieved if projects are undertaken in logical sequence, rather than as sporadic or piecemeal efforts, and if supporting works are carried out simultaneously.

- the general concepts and the plan must be sufficiently flexible to allow adjustment for changes in land use and travel patterns as they occur, and to bear modifications and additions as and when required.

With these criteria in mind, the Recommended Plan has been examined to determine a suitable development sequence for the various projects.

The sequence in which projects should be constructed, and the period during which each should proceed depends upon several factors. It will be evident from the following comments that the programming policy adopted has tended to be weighted toward the transportation needs as defined in the Study Terms of Reference. It is quite likely that the agencies concerned with implementation of the proposals will consider these factors in different gradations of importance, and hence, may make some adjustments to the weightings given herein.

The considerations used were as follows:

10.2.1 Existing Traffic

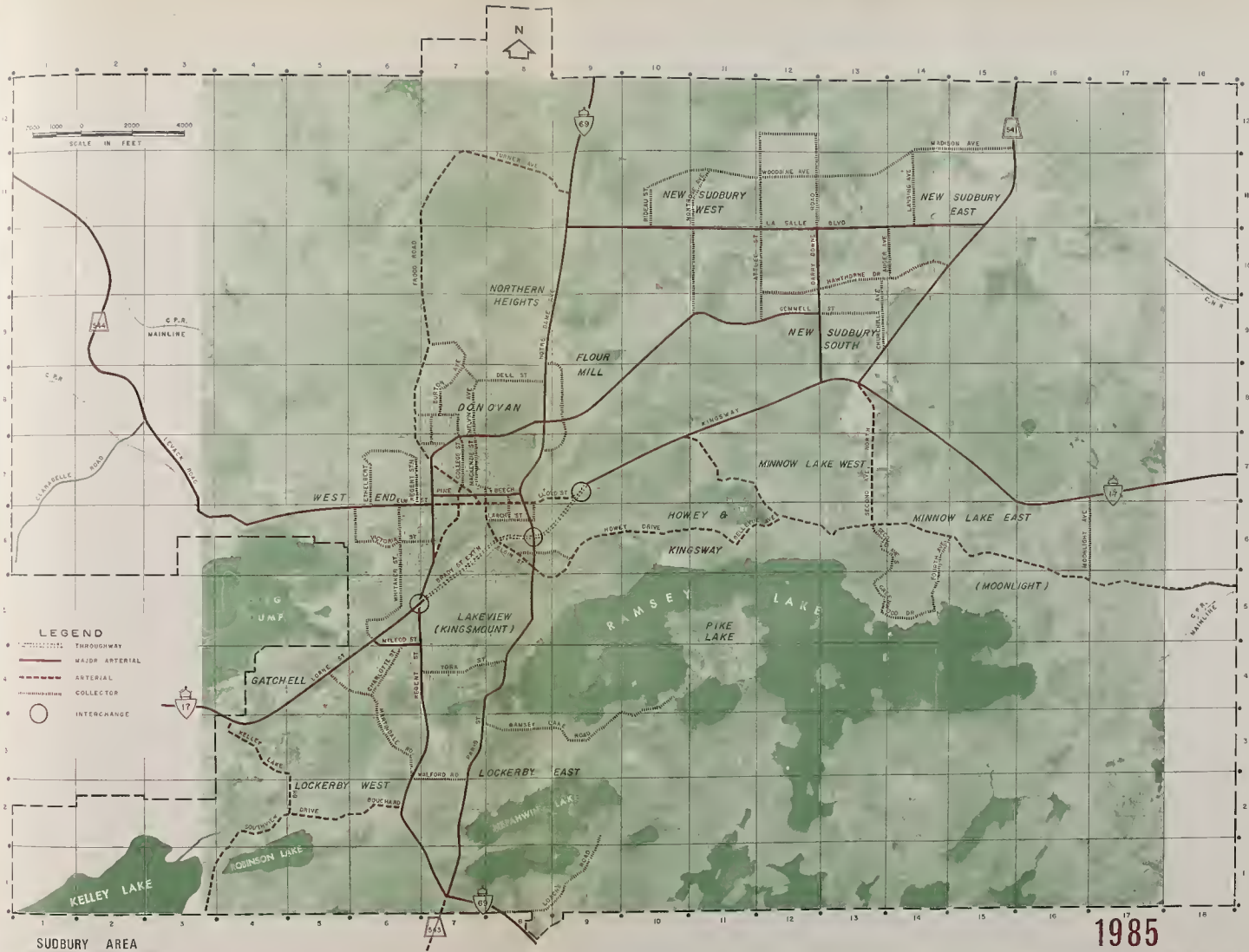
The fact that existing traffic flows on certain sections of roadway exceed calculated capacities - causing accidents, congestion and delay - was considered to be the most important reason for recommending immediate improvement. A number of the proposals mainly designed to alleviate existing problems should be considered as overdue projects: they represent the backlog of work required prior to the 20-year planning period covered by the transportation study.

10.2.2 Future Growth of Traffic

The second consideration in the staging of work was the projected 1985 traffic volume on each section of the network. Not only was the probable total volume considered, but some evaluation was made as to how rapid would be the changes in traffic volume over the planning period. For example, while traffic growth in Sudbury's central area may well be a steady reflection of the Sudbury region's increasing population and vehicle ownership, the growth in fringe areas will occur in conjunction with each particular area's development, which in turn could be retarded until more desirable building land elsewhere has been fully utilized. In some areas, it appears logical to assume that most growth will occur in the near future, and will be followed by a general levelling-off period.

10.2.3 Estimated Roadway Life

The Technical Coordinating Committee supplied estimates of anticipated roadway life. Where it was apparent that a route will require reconstruction at an early date, this would provide a suitable opportunity for any necessary widening and improvement. In cases where a roadway is likely to remain structurally sound for a number of years, it becomes necessary to determine whether traffic loads will require that the City undertake improvements before the structural life expires, whether traffic demands can be accommodated elsewhere until such expiry, or whether some temporary or intermediate work may be warranted.



1985 PROPOSED MAJOR STREET SYSTEM

EXHIBIT 10-A

10.2.4 Sequence of Traffic Improvements

As mentioned in Section 10.1, most roads are integrally dependent on adjacent facilities. Hence, if the maximum effectiveness of a given project is to be attained, supporting facilities must be developed in harmony both with the project and with one another. Since all parts of the network cannot be developed at once, the best results can be obtained by pursuing projects in a logical sequence so that each item can develop its maximum potential,immediately it is added to the network, or very soon thereafter. It would be possible for a complete program to be based entirely upon this consideration, and the practical factors mentioned earlier are normally considered prior to the requirements of sequential scheduling.

At this point, it is pertinent to draw attention to an important item that affects the functional design of all projects mentioned: future traffic assignments are based upon the operation of the COMPLETE 1985 NETWORK described as the Recommended Plan. Nevertheless, as each major project is implemented, some effort should be made to determine the resulting operation of the PARTIALLY COMPLETE NETWORK that will then come into operation.

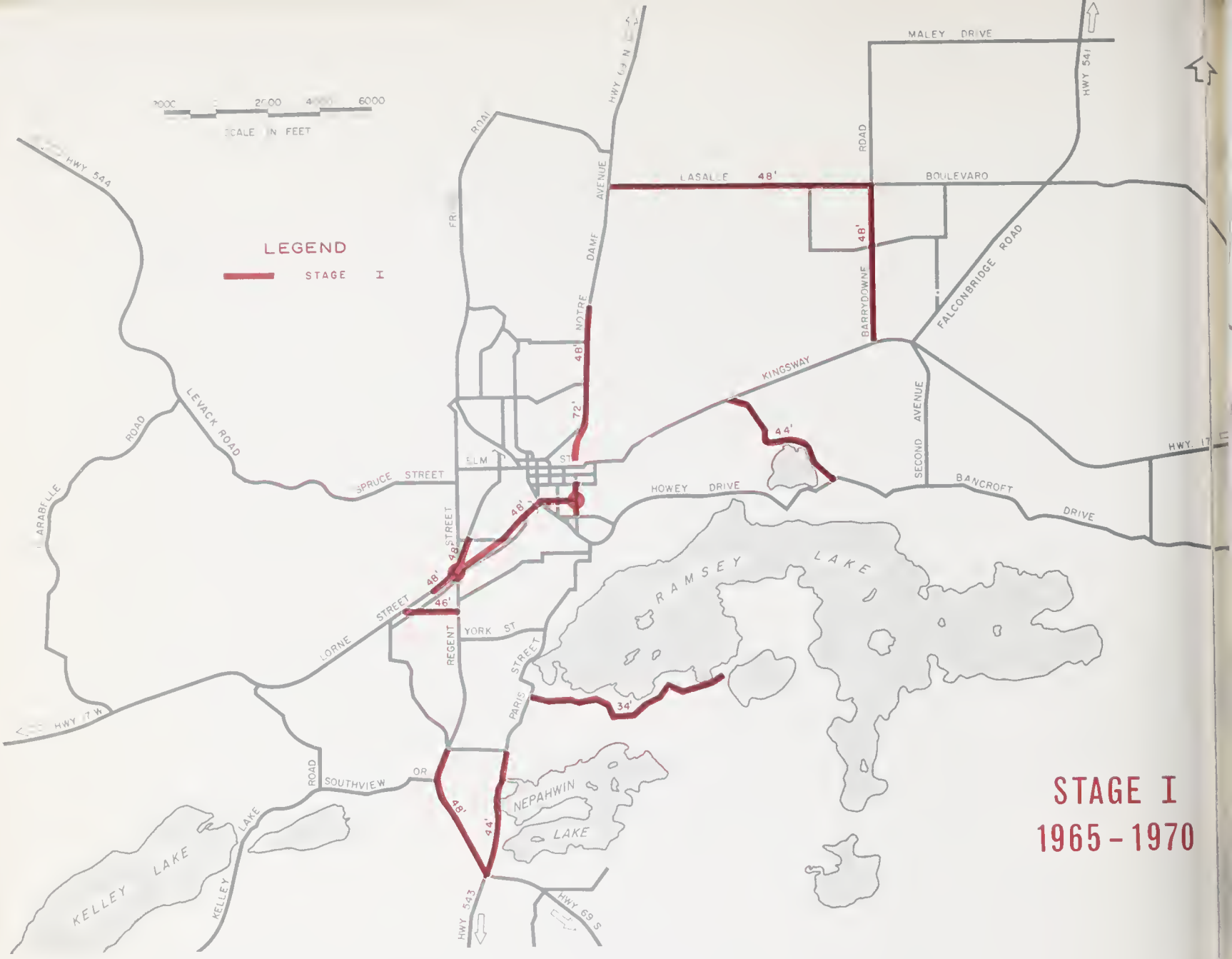
10.2.5 Coordination with Other Work

At the same time as roadway projects are proceeding, a number of other projects will be under development by various agencies. These will include trunk sewer construction, flood control works and urban renewal, to name but a few.

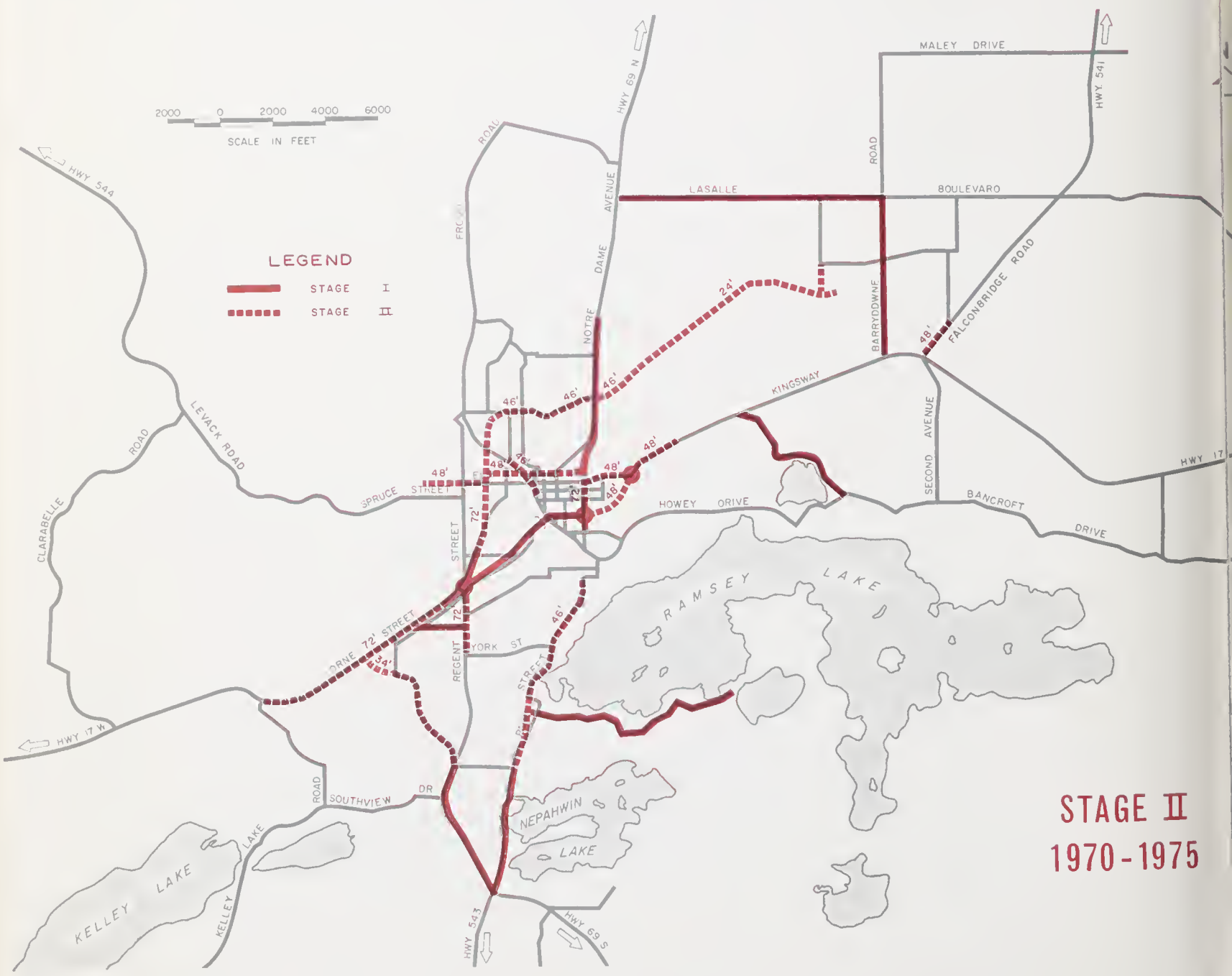
It is logical that all these works should be coordinated as closely as possible, in order to prevent situations arising where, for example, sewer contracts require the breaking out of newly constructed roadways, or urban renewal proceeds on the basis of inadequate access and street patterns. Only very limited knowledge as to the scheduling of these other public works has been available to the transportation study, hence, it must be left to the authorities concerned to try and achieve coordination among various projects.

10.2.6 Prediction of Financial Capability

It has been stated that, for several of the projects referred to, immediate development can be justified on the basis of existing traffic volumes or existing structural deficiencies in the roadway: these, of course, should be undertaken at an early date. Moreover, a number of projects will have to be commenced very soon if the network is to be well enough developed within 10 to 15 years to accommodate the anticipated traffic. It becomes apparent, therefore, that considerable expenditure will be involved at an early date, and the question arises as to whether the agencies concerned will find the proposals within their financial capacities. Indeed, the availability of funds may well be one of the most vital considerations affecting final scheduling of the various projects recommended.



STAGE I
1965 - 1970



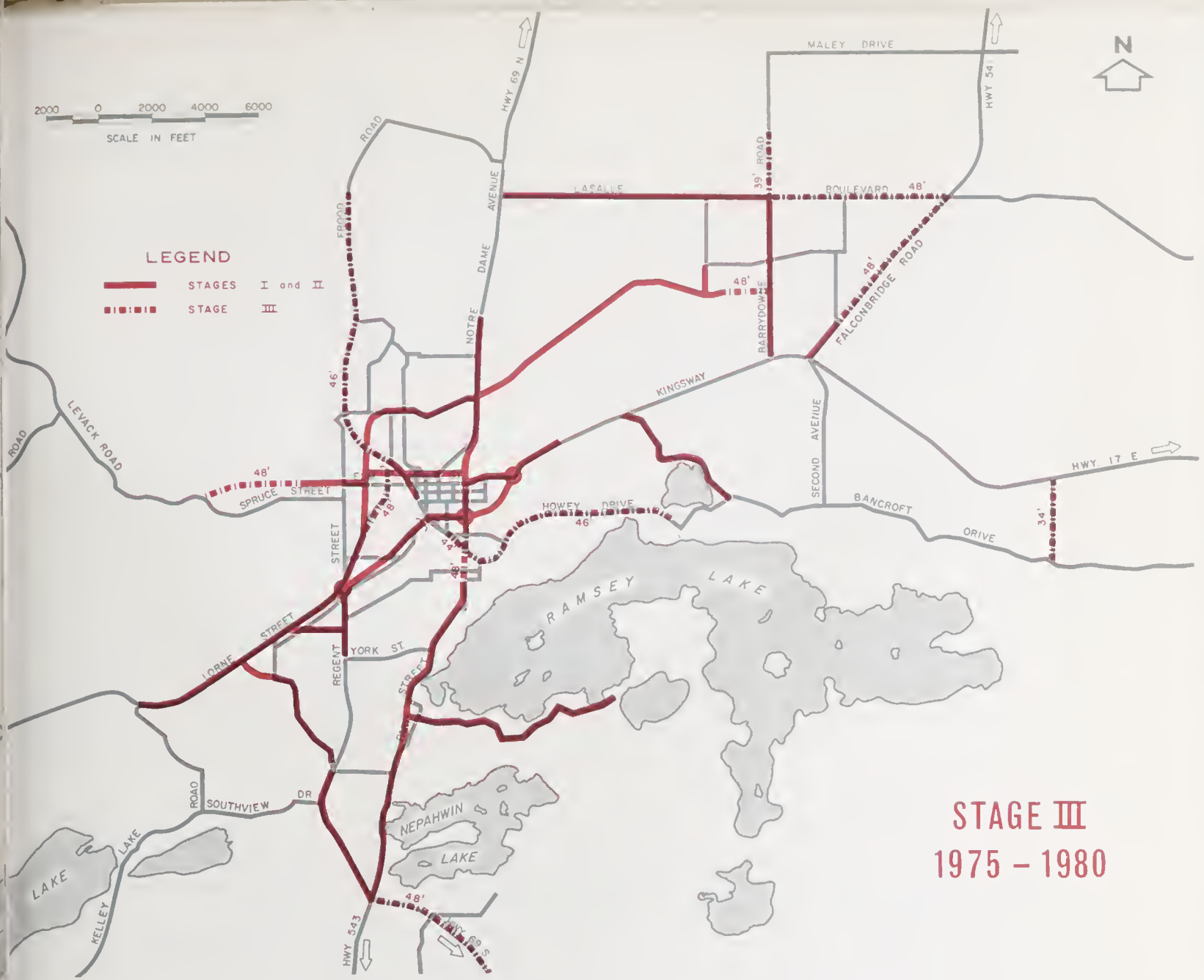
STAGE II
1970 - 1975

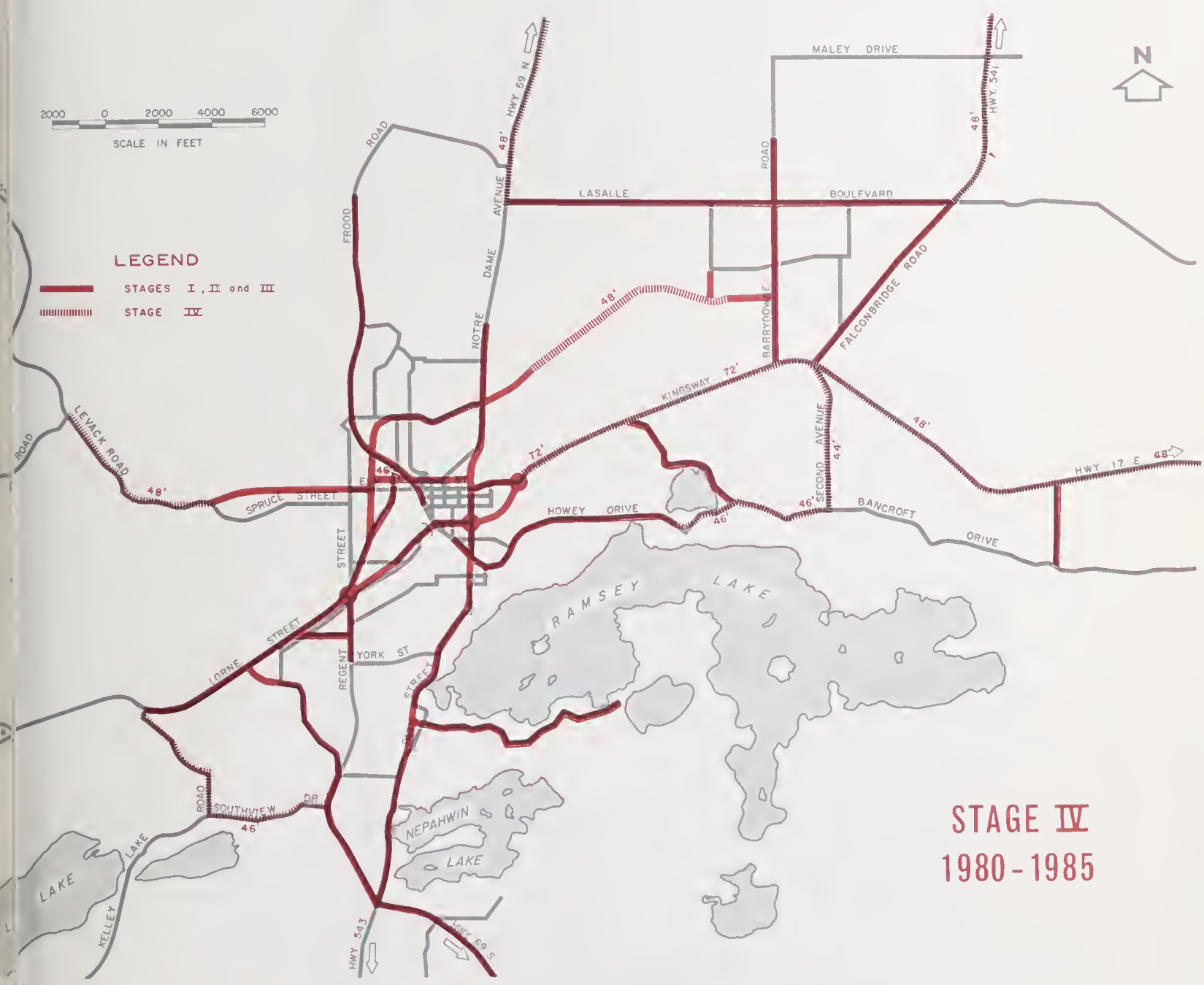
SUDBURY AREA
TRANSPORTATION STUDY

DILLON

THE RECOMMENDED PLAN
STAGES I and II

EXHIBIT





SUDBURY AREA TRANSPORTATION STUDY

DILLON

THE RECOMMENDED PLAN
STAGES III and IV

EXHIBIT 10·C

From the point of view of the Transportation Study, it is virtually impossible to explore this consideration, because transportation service essentially must compete for financial support with other important needs such as those of Community Health, Welfare and Housing. In the wider aspect, it must also compete with other Communities for a share of the total monies available.

To look at this matter in another way, it is vital to the physical development and general efficiency of the City that some means be found to provide the substantial investment necessary to construct and maintain adequate transportation facilities.

Although no specific assessment can be made of the money which will be made available to implement the Study proposals, it is earnestly recommended that no efforts be spared to develop the transportation network at least to the minimum requirements specified in Chapter 8 as the Recommended Plan.

10.3 COST ESTIMATES BY STAGES

Taking cognizance of the six factors discussed above, the Recommended Plan has been examined to determine how its development should be scheduled throughout the 20-year planning period. The period has been sub-divided into four 5-year stages: Exhibits 10.B and 10.C indicate, by means of a series of plans, those proposals recommended for development within each stage.

For each of the major proposals, cost estimates have been prepared. Property costs have been estimated from assessed values, with an allowance for additional payment in the event of compulsory purchase by the Municipality. Construction costs have been based upon prevailing contract rates, with an allowance for soils investigation, surveying and engineering services. The tabulation of cost estimates for each of the stages is shown in Exhibit 10.D.

The construction cost estimates include items for widening the roadway base courses, widening or reconstructing asphalt pavements, and installing storm sewers, curbs and a sidewalk where these are appropriate. In certain cases, where the need is apparent, some allowance has been made in the cost estimates for relocating existing utility poles and providing additional street lighting. As stated earlier, however, there are a number of improvements which are considered to be part of the normal yearly maintenance and improvement programs of the City Departments and NO ALLOWANCE HAS BEEN MADE FOR THESE ITEMS in the present cost estimates. In this category are included realignment, paving, repaving and drainage works on streets where thre are no heavy traffic demands. For example, there is a considerable portion of Bancroft Drive east of Second Avenue which will require work during the planning period. The considerations of this study do not indicate when this work should take place or what standards should be adhered to. It is, therefore, assumed that the City will attend to this and other such

STAGE I (1965-1970)

STREET	FROM: TO:	SECTION	ESTIMATED COSTS		
			Construction	Property	Total
LORNE STREET SOUTH PAUL STREET EXTENSION	Norchin St. Douglas St.	1T-1	$ 3,480,000	$ 2,300,000	$ 5,780,000
PAUL STREET	Douglas St. Drinkwater St.	1T-2	780,000	1,017,750	1,797,750
REGENT STREET SOUTH	Paris St. Walford Rd.	2A-2/3	398,160	40,250	438,410
McLEOD STREET	Ontario St. Regent St. S.	3A-2	95,760	34,500	130,260
BEECH STREET EXTENSION NOTRE DAME AVENUE	Lisgar St. Kathleen St.	5B-2/4	276,000	-	276,000
NOTRE DAME AVENUE	Kathleen St. Wilma St.	5B-3/5	101,160	71,760	172,920
PARIS STREET	Regent St. Walford Rd.	4C-1/3	240,000	-	240,000
RAMSEY LAKE ROAD	Paris St. Southbay Rd.	5C-1	364,560	-	364,560
BANCROFT DRIVE	Bellevue Ave. Kingsway	15C-1/2	513,600	172,500	686,100
LA SALLE BOULEVARD	Notre Dame Ave. Barrydowne Rd.	18C-1/a	415,200	-	415,200
BARRYDOWNE ROAD	Kingsway La Salle Blvd.	20C-1/2	346,080	-	346,080
TOTAL COST OF STAGE I			$ 7,010,520	$ 3,636,760	$ 10,647,280

COLLECTOR STREETS

COMMUNITY	LOCATION	REF.	ESTIMATED COSTS		
			Construction	Property	Total
LAURENTIAN-KINGSMOUNT	N of Ramsey Creek S of CPR Facilities E of Regent St. (Hwy.69)	D-6	$ 50,520	-	$ 50,520
DONOVAN	N of CPR and Beech St. W of Notre Dame Ave.	D-7	45,600	-	45,600
FLOOR MILL	E of Notre Dame Ave. N of Louis S of CNR tracks	D-8	451,200	-	451,200
DOWNTOWN-KINGSWAY	E of Downtown	D-13	33,600	-	33,600
GENERAL COLLECTOR STREET REQUIREMENTS			$ 580,920		$ 580,920

STAGE III (1975 - 1980)

STREET	FROM: TO:	SECTION	ESTIMATED COSTS		
			Construction	Property	Total
LORNE STREET SOUTH	Alder St. Elm St. W.	1A-8/10	$ 131,880	$ 230,000	$ 361,880
HIGHWAY 69 REGENT STREET SOUTH	S. City Limits Paris St.	2A-1	136,080	-	136,080
LEVACK ROAD ELM STREET WEST	Fisher Plant Elm/Atkinson	1B-6/9	390,240	5,750	395,990
ELGIN STREET SOUTH	Van Horne/Minto Nelson/Lourdes/ Morris	2B-5/6	Included in 11C-01		
MORRIS STREET MONT DRIVE	Nelson/Lourdes/ Elgin Bellevue Ave.	2B-7/12	492,000	-	492,000
FALCONBRIDGE ROAD	Churchill Ave. La Salle Blvd.	3B-2/5	253,200	-	253,200
GEMMELL STREET	Extended Attlee St. Barrydowne Rd.	7B-3	170,280	4,140	174,420
PARIS STREET DRINKWATER STREET	John St. Van Horne St.	11C-0/1	1,140,000	402,500	1,542,500
MOONLIGHT AVENUE	Bancroft Dr. Kingsway	17C-1	96,000	-	96,000
LA SALLE BOULEVARD	Barrydowne Rd. Falconridge Rd.	18C-5/6	297,000	-	297,000
BARRYDOWNE ROAD	La Salle Blvd. Woodline Ave.	20C-3	64,440	-	64,440
TOTAL COST OF STAGE III			$ 3,171,120	$ 642,390	$ 3,813,510

STAGE II (1970-1975)

STREET	FROM: TO:	SECTION	ESTIMATED COSTS		
			Construction	Property	Total
BRADY STREET EXTENSION	Drinkwater St. Kingsway/Argyle	1T-3	$ 1,236,000	$ 488,750	$ 1,724,750
LORNE STREET SOUTH	Kelley Lake Rd. Norchin St.	1A-2/4	232,560	178,250	410,810
LORNE STREET SOUTH	Douglas St. Alder St.	1A-7	31,380	603,750	635,130
ELM STREET EAST LLOYD STREET	Lisgar St. Carleton St.	1A-14/16	225,360	115,000	340,360
KINGSWAY	Argyle St. Old City Limits	1A-18	51,480	-	51,480
REGENT STREET SOUTH	York St. Wembley Dr.	2A-5/6	82,320	77,050	159,370
ELM STREET WEST	Atkinson St. Alder St.	1B-10/11	69,600	-	69,600
FALCONRIDGE ROAD	Kingsway Churchill Ave.	3B-1	83,160	-	83,160
PINE STREET	Alder St. N. Lorne St. N.	5B-0	30,000	-	30,000
PINE STREET BEECH STREET	Lorne St. Lisgar St.	5B-1	840,000	115,000	955,000
FROOD ROAD	Elm St. College St.	6B-1	Included in 5B-1		
NEW ROUTE VIA AGNES STREET	Notre Dame Ave. Queen St.	7B-1	193,560	100,625	294,185
NEW ROUTE SOUTH OF C.N.R.	Queen St. or Attlee St. Extension	7B-2	197,100	11,500	208,600
ALDER STREET	Lorne St. Ash St.	10B-1	118,320	-	118,320
NEW ROUTE	Ash St. Kathleen/ College	10B-2	960,000	575,000	1,535,000
KATHLEEN STREET	College St. Notre Dame Ave.	10C-3/4	132,960	47,150	180,110
MARTINDALE ROAD	Regent St. Copper St.	2C-1/3	138,000	-	138,000
MARTINDALE ROAD	Copper St. Lorne St.	2C-4	186,960	48,875	235,835
PARIS STREET	Walford Rd. John St.	4C-4/9	940,920	139,725	1,080,645
DRINKWATER STREET NEW ROAD	Larch St. Notre Dame/ Beech	11C-3	111,160	632,500	743,660
KATHLEEN STREET	College St. Notre Dame Ave.	14C-3/4	Included with Route 10B		
TOTAL COST OF STAGE II			$ 5,860,840	$ 3,133,175	$ 8,994,015

STAGE IV (1980-1985)

STREET	FROM: TO:	SECTION	ESTIMATED COSTS		
			Construction	Property	Total
KINGSWAY	Argyle St. Old City Limits	1A-18	$ 39,840	$ 575,000	$ 614,840
KINGSWAY	Old City Limits Falconridge Hwy.	1A-19/21	598,680	-	598,680
KINGSWAY	Falconridge Hwy. Moonlight Ave.	1A-22/25	598,840	-	598,840
KINGSWAY HIGHWAY 17	Moonlight Ave. E. City Limits	1A-26/27	213,600	-	213,600
LEVACK ROAD	Clarabelle Rd. Fisher Plant	1B-3/5	733,680	-	733,680
LORNE STREET NORTH	Elm St. W. Frood Rd.	1B-18	No estimate		
BELLEVUE AVENUE	Howey Dr. Bancroft Dr.	2B-13	122,400	69,000	191,400
BANCROFT DRIVE	Bellevue Ave. Second Ave.	2B-14/15	232,800	64,800	297,600
FALCONRIDGE ROAD HIGHWAY 541	La Salle Blvd. Haley (City Limits)	3B-5/8	240,000	-	240,000
NOTRE DAME AVENUE HIGHWAY 69	La Salle Blvd. N. City Limits	5B-8/9	318,480	-	318,480
NEW ROUTE SOUTH OF C.N.R.	Queen St. or Attlee St. Extension	7B-2	127,800	-	127,800
SECOND AVENUE	Bancroft Dr. Kingsway	16C-1/3	207,400	-	207,400
TOTAL COST OF STAGE IV			$ 3,433,680	$ 708,400	$ 4,141,880

NOTE:
IMPROVEMENTS TO COLLECTOR STREETS SHOULD BE SCHEDULED IN THE PERIOD 1965 - 1975 (STAGES I & II)

SUMMARY OF ESTIMATED COSTS

	ESTIMATED COSTS		
	Construction	Property	Total
STAGE I	$ 7,010,520	$ 3,636,760	$ 10,647,280
COLLECTOR STREETS	580,920	-	580,920
STAGE II	5,860,840	3,133,175	8,994,015
STAGE III	3,171,120	642,390	3,813,510
STAGE IV	3,433,680	708,400	4,141,880
TOTAL FOR 20-YEAR PERIOD	$ 20,056,984	$ 8,120,725	$ 28,177,209

COST ESTIMATES and CONSTRUCTION STAGING for the RECOMMENDED PLAN

items when the need arises,and seek to bring the roadway to standards consistent with its classification. The costs of such work will be over and above the estimated costs of the recommended transportation plan as tabulated in this report.

The cost estimates presented in this chapter were prepared in the early part of 1965 and were therefore based upon unit prices prevailing in the Sudbury area in 1964 or earlier. Prices during the 1965 construction season have shown a tendency to increase and some allowance for this trend should be made when referring to the figures shown.

The Exhibits 10.D indicates that an expenditure of some $28 million will be required over the coming 20-year period if the area is to keep pace with growing travel demands: this represents an average continuing investment of some $1.4 million annually.Due to the backlog of work, however, and due to the advance planning (e.g. right-of-way acquisition) which will be required to meet future demands, it is apparent that amounts averaging $2.2 million would have to be expended during each of the first ten years of the planning period.

In addition, the City will undoubtedly need to undertake other operational and maintenance work including reconstruction of roadways not forming part of the recommended plan. Thus, the actual annual expenditure on Sudbury's road system, particularly in the period to 1975, can be expected to amount to a considerable sum.

10.4 APPORTIONMENT OF COSTS

The cost of carrying out the recommended plan and the other necessary work will be borne mainly by the City of Sudbury and the Ontario Department of Highways,with certain contributions from other sources such as the Board of Transport Commissioners.

All the cost estimates presented in this chapter are totals of expected construction and property costs and it does not appear feasible at this time to determine precisely how these will be apportioned amongst the contributing agencies.

Under various conditions,the Department of Highways does contribute 33 1/3%, 50%, 75% or occasionally 100% of the costs of portions of various projects. In the case of Sudbury,some agreements already exist covering certain routes,and the status of new proposals contained in the Recommended Plan will be the subject of joint discussions.

For the purpose of illustration it is appropriate to assume that at least 33 1/3% of the cost of all projects in the recommended plan will be contributed by the Department of Highways. It is probable that substantially greater contributions will be forthcoming for certain of the projects recommended,but actual participation by the Department will be the subject of later discussions which, it is hoped, will result in an agreement specifying the projects and the amounts concerned.

The Board of Transport Commissioners has the power to contribute amounts up to $500,000.00 towards the elimination of at-gradecrossings,and it is anticipated that such a contribution would be available for the Lorne/Brady/Regent interchange.

Applying these factors to the staged construction costs in Exhibit 10.D gives the following apportionment:

	TOTAL* Estimated Cost of the Recommended Plan	MINIMUM** Contri-bution by OTHERS	MAXIMUM** Cost to CITY OF SUDBURY
STAGE I (1965-1970)	$10.6 million	$ 3.9 million	$ 6.7 million
COLLECTOR STREETS	$ 0.6 million	$ 0.2 million	$ 0.4 million
STAGE II (1970-1975)	$ 9.0 million	$ 3.0 million	$ 6.0 million
STAGE III (1975-1980)	$ 3.8 million	$ 1.3 million	$ 2.5 million
STAGE IV (1980-1985)	$ 4.1 million	$ 1.4 million	$ 2.7 million
TOTAL:	$28.1 million	$ 9.8 million	$18.3 million

* Operational maintenance and reconstruction work by the City on roads not included in the recommended plan will involve additional costs not estimated in this study (see text)

** Assumes 33 1/3% of costs contributed by Department of Highways (see discussion in text)

10.5 COST ESTIMATES FOR THE ALTERNATE PLAN

In addition to the cost estimates prepared for the recommended plan, certain cost estimates were prepared for portions of the alternate plan discussed in Chapter 9. In particular, the cost of the Brady Street extension to the Kingsway/ Falconbridge Road was estimated as a means of comparison with the proposals in the Recommended Plan,as follows:

- the alternate plan includes the extension of Brady Street to Kingsway/Falconbridge (2T-1, $2.8 million) in lieu of the Brady Street extension to Kingsway/Argyle (1T-3, $1.7 million).
  - i.e. Alternate plan represents INCREASED cost of $1.1 million.

- the alternate plan would require only 4 lane capacity on Kingsway (1A-19/21) and avoid the recommended widening to 6 lanes
  - i.e. Alternate plan represents DECREASED cost of $0.6 million.

- the alternate plan would require the widening of Notre Dame Avenue from Kathleen Street to La Salle Boulevard (5B-4/7) from 4 lanes ($0.2 million) to 6 lanes ($0.6 million)
  - i.e. Alternate plan represents INCREASED cost of $0.4 million.

- the alternate plan would eliminate the need for a new route from Notre Dame Avenue to Barrydowne Road (7B-1/3)
  - i.e. Alternate plan represents DECREASED cost of $0.8 million.

- the alternate plan would require the earlier widening of La Salle Boulevard
  - i.e. NO CHANGE in cost

The net result of these comparisons is that the alternate plan would appear to cost an additional $100,000.

Functional considerations, as they affect the alternative plan, were discussed at some length in Chapter 9 of this report. When these are viewed together with the financial implications tabulated above, it is clear that the Recommended Plan has the advantage of providing superior service at no greater cost.

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CHAPTER 11

IMPLEMENTING AND UPDATING THE PLAN

Early in this report, Exhibit 2A (Chapter 2) showed the procedure by which a Transportation Planning Program is established. Reference to this exhibit shows that when a Plan has been produced, two important stages remain to be carried out.

- Stage V - Obtaining Plan Approval
- Stage VI - Putting the Plan to Work

The Sudbury Area Transportation Study has presented a transportation plan (Chapter 8), and this should provide a starting point for all interested persons and agencies to go forward, to decide upon a course of action, and to work towards the physical realization of the plan.

The Transportation Study and Recommended Plan point the way, and this chapter is intended to offer some further guideposts towards the successful execution of the plan for the benefit of the Sudbury Area.

11.1 REVIEWING THE PLAN

The primary requirement leading to the implementation of a Transportation Plan is that all persons and agencies involved should analyze the Study findings, together with the principles and the proposals put forward, in order to discover for themselves what has been done and to determine what actions they must take towards its implementation.

Only with the understanding, active support and participation of the many persons and groups concerned, can a worthwhile effort be made to carry out a comprehensive plan.

In their examination of the Plan, it is quite probable that various groups will tender further ideas and proposals which should be reviewed and compared with the proposals of the Plan. Before changes are made, a careful recapitulation of the underlying conditions and principles should be carried out to ensure that any modifications or revisions will, in fact, offer advantages equal or superior to those of original proposals.

In order to make a comparison between original proposals and subsequent suggestions, it is essential to achieve a full appreciation of the several factors which have influenced the development of the Plan, with particular reference to the following:

(i) The Study is concerned with an "Average Weekday"; and the roadway capacities on which proposals are based in turn rest upon certain assumptions regarding peak hour volumes. Any changes in shopping hours, working patterns or employment which would drastically change the distribution of traffic throughout the day, might affect the entire system.

(ii) The Recommended Plan covers a system or network of transportation facilities, and any major modification to individual proposals must, in turn, affect other elements throughout much or all of the remaining system.

(iii) The development of the Recommended Plan is based upon projections of population and vehicle ownership over the 20-year planning period, and assumes that future distribution of land use throughout the area will follow present trends and be in accordance with the Official Plan. A major variation in any of these aspects will affect the future traffic demands upon the system, and therefore the justification and priorities for the various proposals.

(iv) Whether or not the projected land use pattern develops by the year 1985, it should be recognized that Sudbury will ultimately develop beyond those population, employment and floor space estimates upon which this Plan is based. Thus, allowance must be made for some further expansion of the proposed network.

Where it is apparent that an existing road will reach the limit of its capacity by 1985, some additional right-of-way, or land for a relief route, should be provided before the need becomes critical. Where it is clear that further development will require additional roads, plans should be drawn to reserve right-of-way while land is available.

(v) The Plan in its present form is <u>conceptual</u>: the proposals, cost estimates and staging are based upon available data - detailed surveys of engineering features of each project have not yet been carried out. Before the proposals can be implemented, they must be <u>functionally designed</u>, having recourse to large-scale plans, and to careful consideration of route function, design standards,soil conditions, drainage and many other essential factors.

It would be impractical to undertake complete functional design of all the projects forming part of the Recommended Plan, within the context of the Transportation Study.

To provide maximum benefit to the municipality, functional design should only be carried out after authorization has been given to proceed towards the development and ultimate construction of a particular project.

(vi) The future traffic assignments and the detailed proposals are based upon the operation of the completed network. No evaluation has been made of how proposals will function in various interim stages prior to the attainment of the whole Recommended Plan. When a project has been adopted, and progresses to the functional design stage, consideration should be given to both its short-term and its ultimate effects upon traffic patterns throughout the network.

11.2 ADOPTING THE PLAN

After the Transportation Plan has been fully reviewed by all interested bodies, it should be formally adopted as an article of policy. Suitable adjustments should be made to other articles of policy which might be affected: .n particular, the Sudbury Official Plan should be amended where necessary, to incorporate the Transportation Plan as adopted. Also, every effort should be made to publicize the adopted plan, in order to make all parties aware of the intended development.

Adoption of the plan is a pre-requisite of the budgeting and other programming functions of the City administration, and provides considerable assistance when the City's needs are the subject of discussions with the Department of Highways or other agencies (e.g. when developing connecting link designations, mentioned below).

Adoption of the plan does not in itself restrict the City to a rigid course of action, but provides a framework within which to work. All the discussions in Section 11.1 above show that the plan must be subject to modification and refinement of detail as changing conditions affect the original precepts. In particular, the specific location and alignment of routes will be subject to changes and improvements when functional design is carried out for the various projects.

Notwithstanding the possible modifications which may occur, it is of fundamental importance that action be taken to adopt this plan as a step towards the building of adequate transportation facilities to meet Sudbury's future needs.

11.3 OBTAINING FINANCE

After the Plan has been adopted, the necessary money must be made available to undertake detailed design and construction. Funds will be provided jointly by the City of Sudbury and by the Province of Ontario, with certain contributions being obtainable for specified purposes from such bodies as the Board of Transport Commissioners (i.e. within the context of the Railway Grade Crossing Elimination Fund). The Department of Highways, on behalf of the Province, generally provides one third of major road construction and right-of-way costs, and a higher percentage of the costs of designated King's Highway Connecting Links.

Following adoption of the Transportation Plan, the City of Sudbury will wish to discuss the designation of Highway Connecting Links with the Department, and to negotiate agreements for contributions by the Department.

The financial program and annual budgets of the City of Sudbury should then be organized to reflect the Corporation's intentions respecting the implementation of the Transportation Plan.

11.4 SOME AIDS TO PLAN IMPLEMENTATION

The more ADVANCE PLANNING that can be undertaken early in the planning period, the greater will be the potential benefits arising from the development of proposals. With regard to land acquisition, it may often be of considerable advantage for the City to purchase needed land whenever it comes on the market, rather than wait until a project is ready to commence, and then be involved in expropriation procedures throughout, with increased property values and additional payments for forced sales. Even if early acquisition is not feasible, means should be sought to limit improvement and redevelopment of property which will later be required for roadway development.

The dollars spent on the transportation system will go further and produce greater benefits if all elements are the product of GOOD DESIGN. Criteria of good design may take many forms, but to cite just one example: the capacity of major streets as well as their safe operation is related to elements of the adjacent development, e.g. positioning of buildings and traffic produced. The designation of design standards for all accesses, and strict adherence to good design principles* will go far toward fostering safety and convenience for the public at large.

11.5 KEEPING THE PLAN UP TO DATE

Although the Recommended Transportation Plan and the suggested staging are intended to span a 20-year period, the growth projections will require constant review to check whether development is in fact occurring as currently predicted. The yearly construction programs should make allowance for changing conditions where these are readily apparent, and a complete overhaul of the Transportation Plan should be carried out at 5-yearly intervals, in order to check the effects upon the system of work already undertaken, and to extend the range of the Plan further into the future. It should be noted that some elements of the Recommended Plan are expected to be operating at or near their capacities by the year 1985, and that further improvements to the network should, therefore, be planned to accommodate traffic growth beyond that date.

Many things will be required to keep the plan vigorous and sufficiently flexible to keep pace with area development. In particular, the surveys and analyses described in Chapter 3 should be continuously updated and reviewed so that they provide a current picture of the street system and its functioning. In addition:

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* e.g. see Department of Highways' "Commercial Site Access Standards"

- The street inventory should be kept up to date to show where new work has been carried out, and where further construction is most urgently needed.

- Compilation of accident data should continue, and this should be analyzed to determine how the safety of traffic operations can be improved by means of either further controls or physical design and reconstruction.

- Periodic traffic counts should be made at selected control stations, to establish the pattern of seasonal variations in traffic flow as well as longer-term trends.

- A complete annual program of traffic volume counting should be instituted to show the operation of streets within the system.

- Turning movement counts and capacity calculations should be undertaken regularly at major intersections to show where capacity problems are developing.

- Speed and delay runs on major streets should be carried out according to an established program so that the location and causes of congestion can be diagnosed and dealt with.

- Vehicle classification counts should be made periodically to determine whether the characteristics of traffic are changing.

- A check of "in" and "out" movements at the downtown cordon, together with a parking usage survey, should be undertaken annually to discover whether the traffic components (through traffic; traffic with C.B.D. destinations) are changing with changes in downtown land use.

If the city keeps a comprehensive and continuing record of the above details, to show the variation of traffic patterns and to analyze the operation of the street system, these will provide a very valuable foundation for the recommended 5-yearly re-appraisals of the Transportation Plan.

11.6 THE NEED FOR PUBLIC SUPPORT

The key to the success of the Transportation Plan, and the only way that ideas and proposals can be transformed from drawings and words into the reality of concrete and asphalt, is to ensure that all the people of Sudbury understand the Plan and are willing to lend their support to a campaign of positive action - a campaign which will contribute to their own benefit, now and in the future.

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LIST OF EXHIBITS

EXHIBIT	*DESCRIPTION*	
A.3(i)	*TRIP PURPOSES AS REPORTED IN THE HOME INTERVIEW STUDY*	*Page 162*
A.3(ii)	*TRIP INTERCHANGE BETWEEN MAJOR LAND USES*	*Page 163*
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A.A	*HOME INTERVIEW REPORT FORMS*	*Page 167*
A.B	*TRUCK AND TAXI REPORT FORMS*	*Page 168*
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A.D	*1963 TRIP TABLES FOR AN AVERAGE WEEKDAY*	*following Page 170*
A.E	*ESTIMATION OF 1985 VEHICLE TRIPS*	*following Page 170*
A.F	*1985 TRIP TABLES FOR AN AVERAGE WEEKDAY*	*following Page 170*
A.G	*VOLUMES CAPACITIES AND ACCIDENTS AT MAJOR INTERSECTIONS*	*Pages 171 to 174*
	ESTIMATION OF DAILY ROADWAY CAPACITY	*Page 174*
A.H	*SPEED AND DELAY SURVEY - MAJOR ROUTE CHARACTERISTICS*	*Pages 175 to 183*
A.J	*CITY OF SUDBURY ROADWAY STANDARDS*	*Page 184*
A.K	*CHARACTERISTICS OF TRANSIT TRIPS*	*following Page 184*
A.L	*SCHEDULE OF PROJECTS STUDIED*	*Pages 185 to 189*
O.O	*Sudbury Street Map 1963 Showing Origin and Destination Zones*	
O.A	*1985 Major Street System as proposed by the Recommended Plan*	

Exhibits O.O and O.A are to be found folded in the pocket inside the back cover

NOTES ON THE CALCULATION OF INTERSECTION CAPACITIES

The capacity of a route can be no greater than the capacity of the least efficient intersection along the route. Therefore, the traffic carrying capability of the whole street system is determined by the capacities of the intersections.

Many of the factors which affect the capacity of a conventional signalized intersection have been recognized and evaluated over a period of years. These factors include the approach widths, the available "green time" for a movement, the percentage of turning vehicles, the percentage of heavy commercial vehicles, the arrangement of bus stops, etc. The requirements and procedures for calculation of intersection capacities are explained in the Highway Capacity Manual prepared by the U.S. Bureau of Public Roads. The calculations for Sudbury's signalized intersections have followed the methods outlined in the Highway Capacity Manual (1951), and the subsequent revisions thereto.

Certain conditions are NOT allowed for in this method. In particular, the Ontario practice of permitting right turning vehicles to proceed on a red light is not accounted for, and it has been observed in this study that the effects of permitting this manoeuvre can vary widely depending on the demand of turning movements and the volume of traffic on the cross street. A further item complicating the capacity calculations in Sudbury is the practice of providing a special pedestrian phase at certain major downtown intersections. This, in turn, leads to the prohibition of right turns on a red light. Although these special features were not specifically allowed for, their effects are slight, and will not undermine the validity of the calculations. In any case, the calculated capacity figures should only be used as a guide for interpreting actual observations and operating experience at a given intersection.

Two measures of capacity - POSSIBLE CAPACITY and PRACTICAL CAPACITY - are referred to in the calculations.

POSSIBLE CAPACITY is defined as the maximum number of vehicles which can pass a given point on a lane or roadway under prevailing roadway and traffic conditions.

PRACTICAL CAPACITY is the maximum number of vehicles which can pass a given point under prevailing roadway and traffic conditions WITHOUT RESULTING IN UNDUE CONGESTION OR UNDUE DELAYS.

POSSIBLE CAPACITY has been found to be approximately 20% GREATER THAN PRACTICAL CAPACITY.

In analyzing intersection capacities for Sudbury, the PEAK HOURLY volume has been compared with the PRACTICAL CAPACITY of each approach, and the PEAK 15-MINUTE volume has been compared with the POSSIBLE CAPACITY. In either case, a Volume/Capacity ratio greater than 0.90 indicates an area of concern.

Volume/Capacity ratios greater than 1.00 occur at several locations, and these indicate that one approach of an intersection is already accommodating more than its theoretical capacity. Such a situation requires immediate further study. In a few cases, only physical intersection improvements will alleviate the problems revealed, but in most instances, the retiming of the traffic signals will be adequate to provide relief.

At intersections with pedestrian phases, there are twelve possible pedestrian movements which occur simultaneously within a period of 7 - 17 seconds. In order to observe these movements, some short movie films of intersection operation were taken and these revealed the following:

- vehicular capacity of an intersection with a pedestrian phase will be REDUCED for two reasons:
  (i) there is less total "green-time" available for vehicular movements, and
  (ii) right turns during the vehicular all-red phase must be prohibited, in order to protect the exclusive pedestrian movement.
- at those intersections where turning movements are heavy (e.g. Durham Street traffic turning onto Elm Street), the restriction of the pedestrian movements to an exclusive phase INCREASES the capacity by eliminating the conflicts between pedestrians and turning vehicles.
- a given intersection with a pedestrian phase has a "pedestrian capacity" which depends upon the area of sidewalk available at the corners of the intersection, the waiting time between pedestrian phases, and the directional diversity of pedestrian flows.

In addition to the above observations, it is noted that very high accident frequencies have been recorded at certain intersections having exclusive pedestrian signal phases (Elgin/Elm, Durham/Larch, Durham/Cedar, Durham/Elm). More detailed analysis of the accident experience may indicate how the geometric layout and operation of these intersections should be improved. If the accident record cannot be improved while these intersections operate with the exclusive pedestrian signal phase, then the City should consider eliminating this phase.

Perhaps the first thing noticed by the visitor to Sudbury is the different operational controls used at intersections in the downtown area. The street system in Downtown Sudbury has a number of 3-way "Y" and "T" intersections interspersed with the more common 4-way intersections. Some intersections have all three or all four approaches controlled with stop signs, while others are controlled by the more conventional 2-way stop arrangements.

Some intersections have a pedestrian signal phase with "WALK/DON'T WALK" signs mounted diagonally, and some intersections are signalized to require pedestrians to cross with the standard green (vehicle) indications. It is quite possible that the high level of accidents recorded in the area bounded by Elgin, Beech, Lisgar and Larch Streets may be due in part, to this diversity of intersectional control, which engenders some degree of confusion and therefore hazard, for both pedestrians and drivers.

The capacity calculations at a number of intersections indicate some signal retiming would be appropriate during peak hours. No counts were taken outside the 4:00 p.m. - 6:00 p.m. period to determine whether capacities were adequate and signals properly timed for off-peak conditions.

Where an intersection is controlled by the use of stop signs on one or more of the approaches, the estimation of capacity is usually based upon a detailed evaluation of gaps in the approaching traffic flows, and upon the determination of gap-lengths acceptable to a stopped driver wishing to merge with or cross the moving traffic. Where all approaches are controlled by stop signs, as at a number of locations throughout Sudbury, capacity analysis techniques become quite complex, and current research has gone only part of the way towards estimating capacity under such conditions. This Study included no capacity calculations for intersections currently controlled by stop signs, and it is recommended that the City continue to use empirical methods, together with detailed counts and observations of vehicle delays, to determine when such intersections should be put under traffic signal control.

APPENDIX A.2

PROCEDURE FOR VALIDATION AND ADJUSTMENT OF ORIGIN-DESTINATION SURVEY DATA

Three types of interviews were carried out during the course of the transportation study. The interview techniques are referred to in Chapter 2 and the interview forms are shown in the appendix (Exhibits A.A, A.B and A.C). The home interviews represented a sample of households, and the data was expanded on the basis of the dwelling unit count to represent total information. The roadside interviews at the External Cordon were expanded to represent average 24-hour, two-directional traffic volumes as determined by automatic traffic recorders. Truck and Taxi Reports were expanded on the basis of a complete listing of these vehicles.

Certain minor checking procedures were applied to the home interview data. For example, the expanded population figures derived from the interviews were compared with actual zone-by-zone population counts, and the expanded figure of 67,300 persons over 5 years old compared quite favourably with the count of 71,300 persons in the same age groups.

When all interview data had been expanded, it was transferred to punched cards, and specific computer tabulations were made to compare and check portions of trip information recorded. The three major checking procedures were as follows:

A.2.1 The External Cordon Check

Certain of the data collected by means of the roadside interviews overlapped with data from the home interview survey.

In order to compare the duplicated information, a tabulation was made of roadside interviews having reported home base within the cordon, and a tabulation was made of trips from the home interview survey which crossed the cordon. The tabulations showed that the volume of the external-internal movement by Sudbury residents was 10,300 trips in 12 hours according to the roadside interviews, and 8,900 trips over the same period according to the home interview data.

From this it was apparent that there was some under-reporting of trips in the home interview survey, probably accompanied by under-expansion, and that these were the less accurate data. (It was to be expected that the home interviews would be less accurate in detail, since the home interview survey sampled 1 out of every 8 households whereas roadside interviewing sampled approximately 1 out of every 3 cordon crossing trips).

Hence, all cordon crossing trips were deleted from the home interview data and the roadside interviews were accepted as the best estimate of Internal-External and External-Internal trips. The remaining home interview data was then compiled with the roadside interviews and truck/taxi data to provide a composite body of origin-destination data representing the aggregate travel movement throughout the area.

A.2.2. The Screen Line Check

The C.P.R. main line running N.W.-S.E. across the City divides the study area into two portions. For the purposes of the collection and and analysis of traffic data, this line was designated as a screen line, and the boundaries of origin-destination zones were drawn in such a way that no zone was cut by the screen line.

There are five crossings of the C.P.R. line (at Kathleen, Lorne, Elm, Brady and Nelson Streets) and detailed traffic counts were carried out at each crossing point as described in Sections 2.4.4 and 2.4.5. The traffic counts showed that some 57,000 vehicles crossed the screen line on a typical weekday, and that some 42,400 crossings occurred in the 12-hour period 7 a.m. to 7 p.m.

The whole body of trip data compiled from the O-D interviews was then sorted to determine the total number of trips with origin and destination zones on opposite sides of the screen line. This sorting of interview data indicated some 29,200 "traceable" screen line crossings in the 7 a.m. to 7 p.m. period.

Comparison of the above figures shows that the number of vehicles COUNTED was considerably greater than the number of trips REPORTED.

There are a number of reasons why traffic counts would be expected to exceed the reported trip volumes:

- Some under-reporting is typical of the procedures used in the home interview and truck/taxi interview surveys because respondents neglect to report EVERY trip they have made.
- The interviewing procedures do not take into account a segment of the traffic movement; i.e. internal trips made by non-residents. Whereas the home interviews and truck/taxi interviews theoretically record ALL trips made by the residents of the area, the roadside interviews and the External Cordon record only the SINGLE cordon crossing trip. Any subsequent trips made by non-residents travelling from place to place inside the City is not subject to interview. The status of Sudbury as a regional shopping and service centre may make these trips a significant element of the area travel patterns, although there was no satisfactory means of evaluating them within the context of the present study.
- Logical routings between zones on the same side of the screen line may result in DOUBLE screen line crossings, which would not be predictable in the above analysis of origins and destinations.
- Circulating traffic can give rise to DOUBLE screen line crossings which cannot be adequately allowed for within the context of origin and destination information.

In order to minimize the effects of the differences between counts and trip reports, adjustments were applied to the O-D data: the correction for under-reporting and omitted trips was applied by expansion of the existing data. No correction was made for the logical DOUBLE crossings, because the effects of this discrepancy would probably be offset by the "network loading" procedures described later. (If

the assignment (loading) process is adequately carried out, those trips which logically cross the screen line in two places are so assigned). The correction for circulating traffic was calculated and applied where appropriate to the final traffic volume assignments on specific routes.

It has been determined in other studies that the DOUBLE crossings account for 10 to 20 percent of the total traffic, and that the expanded origin-destination interview data should therefore amount to between 80 and 90 percent of the total screen line count.

Before any adjustments were made to the interview data, some further analysis was undertaken which showed that discrepancies between reported trips and traffic counts were somewhat greater in off-peak than in peak hours, thus illustrating a further point: work trips are generally better reported than more casual trips (e.g. shopping, recreation, etc.).

Based upon these observations, an adjustment of 10% was added to all work trips, while non-work trips were adjusted by 50% so that the body of trip data would represent 83% of screen line crossings. At this point the 1963 trip table (Exhibit A.D) was prepared.

A.2.3. Comparison with Measured Route Volumes

Using the assignment programs developed by the Department of Highways, the 1963 trips were assigned to a network representing the existing streets. Assigned route volumes were compared with actual volume counts. As a result of this process, some minor manual re-assignments were made which were later applied to 1985 traffic assignments in the same manner.

TRIP CHARACTERISTICS FROM THE HOME INTERVIEW DATA

Prior to commencing trip projection, a number of special tabulations were derived from the interview data in order to examine the relationships among travel mode, trip purpose, land use, etc. The results of certain of these investigations are presented in the attached exhibits.

Exhibit A.3(i) indicates how trips were distributed among the three major travel modes as follows:

Auto Drivers	- 80,713 trips
Auto and Taxi Passengers	- 32,810 trips
Transit Passengers	- 17,286 trips

Study of this Exhibit reveals a number of points, some of which may be considered quite predictable and logical, e.g.:

- most non-home-based trips are made by automobile drivers, while very few are made on public transit vehicles.
- students' school trips are made mostly as auto passengers or as transit passengers.
- transit trips to and from work account for nearly 28%, school trips 27% and shopping trips 18% of all transit trips.
- of total trips made by automobile drivers, work trips account for only 16%, while school and shopping account for 1% and 16%, respectively.

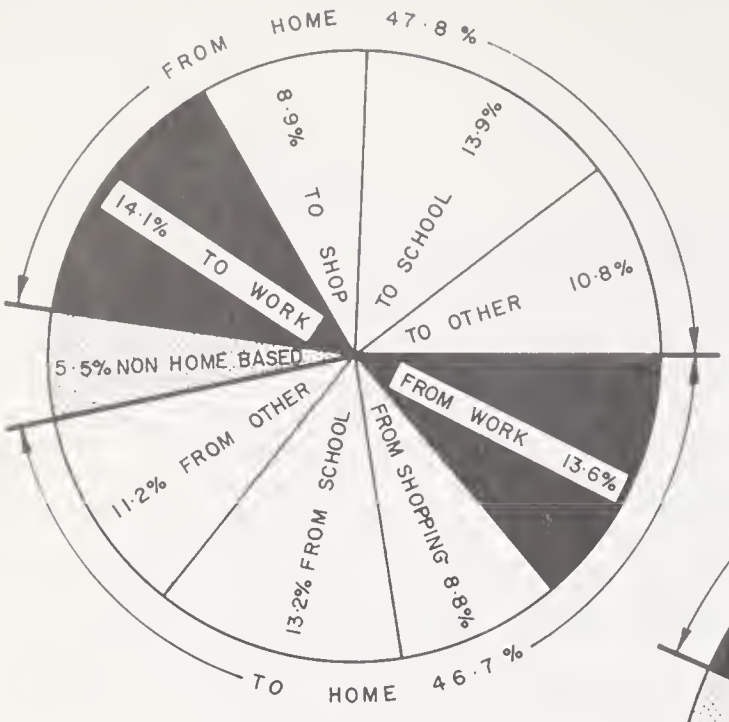
Exhibit A.3(ii) shows the interchange of trips among major land uses. Within the cordon, the heaviest movements occur among residential uses, commercial uses and public buildings, with industry accounting for only some 8,000 trips. For trips crossing the cordon, the heaviest movement involves persons resident outside the City who visit commercial establishments, residential uses, and public buildings within the City. The largest single external traffic generator for City residents is industrial land use, and in the case of Sudbury, this is represented by the mines, smelters and refineries at Copper Cliff, Coniston, etc.

The factors exhibited in (b) for trips crossing the external cordon should be viewed with caution, considering the inherent limitations of the data involved. Since interviewing was done only in the inbound direction for 12 daylight hours, a number of important trips, including those of industrial workers on night-time shifts, do not appear in the sample. Conversely, inbound shopping trips would be quite fully accounted for. Moreover, subsequent expansion of the interview data to the measured 24-hour volumes will have emphasized any distortion in the information collected at the external cordon.

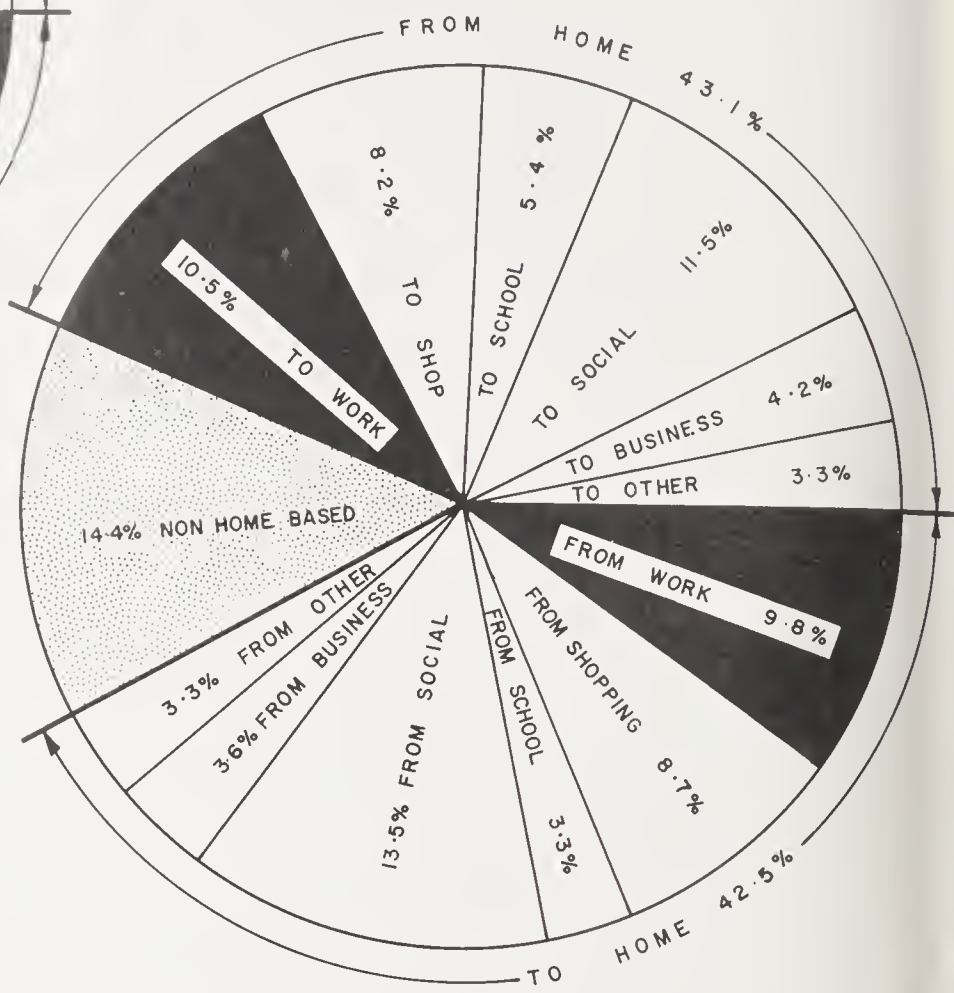
Exhibit A.3(iii) shows the reported trip purposes associated with each land use, and is virtually self-explanatory.

TRIP PURPOSES

AS REPORTED IN THE HOME INTERVIEW STUDY



17,286 TRIPS BY
TRANSIT PASSENGERS



32,810 TRIPS BY
AUTO & TAXI PASSENGERS

80,713 TRIPS BY
AUTO DRIVERS

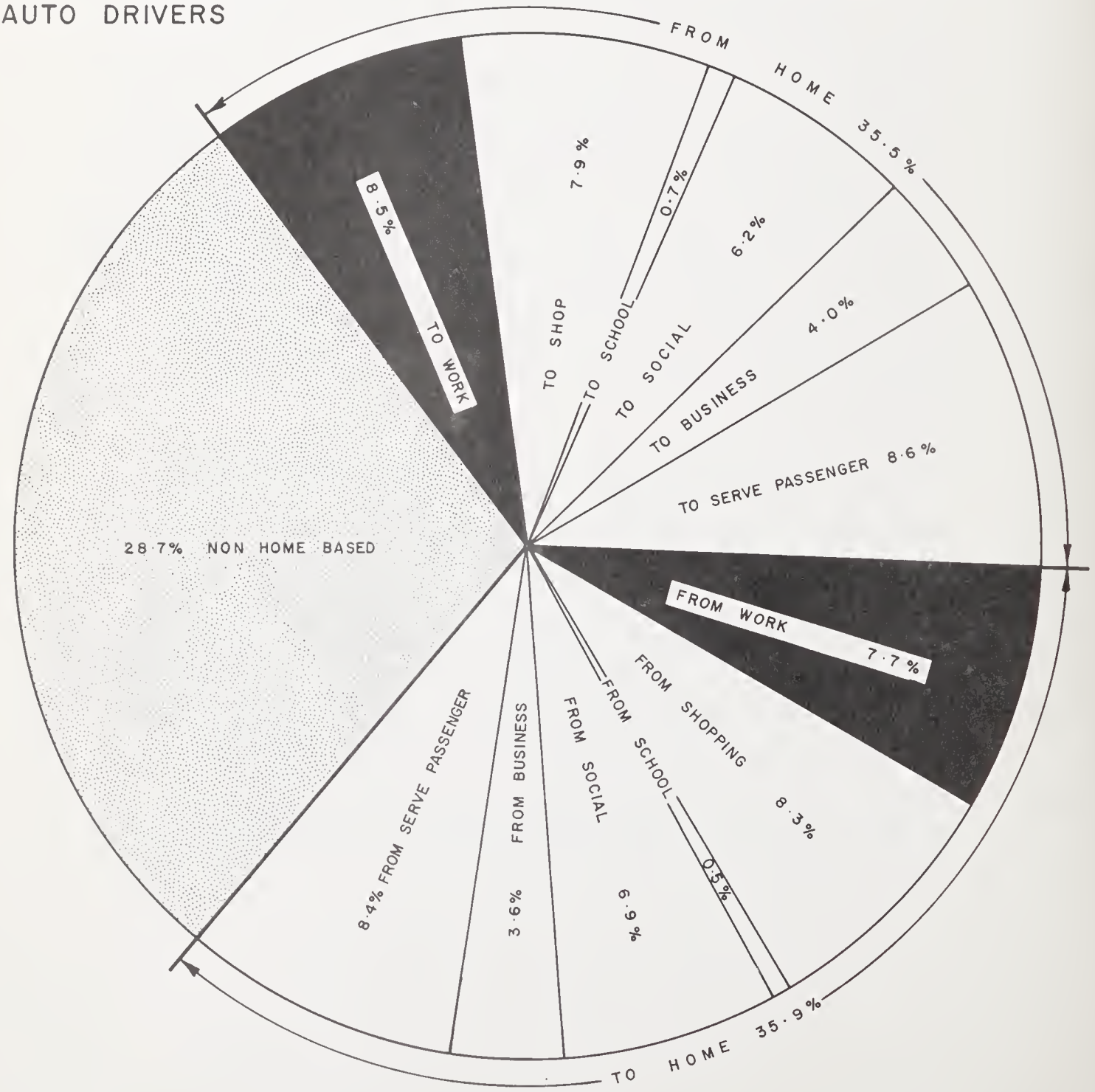
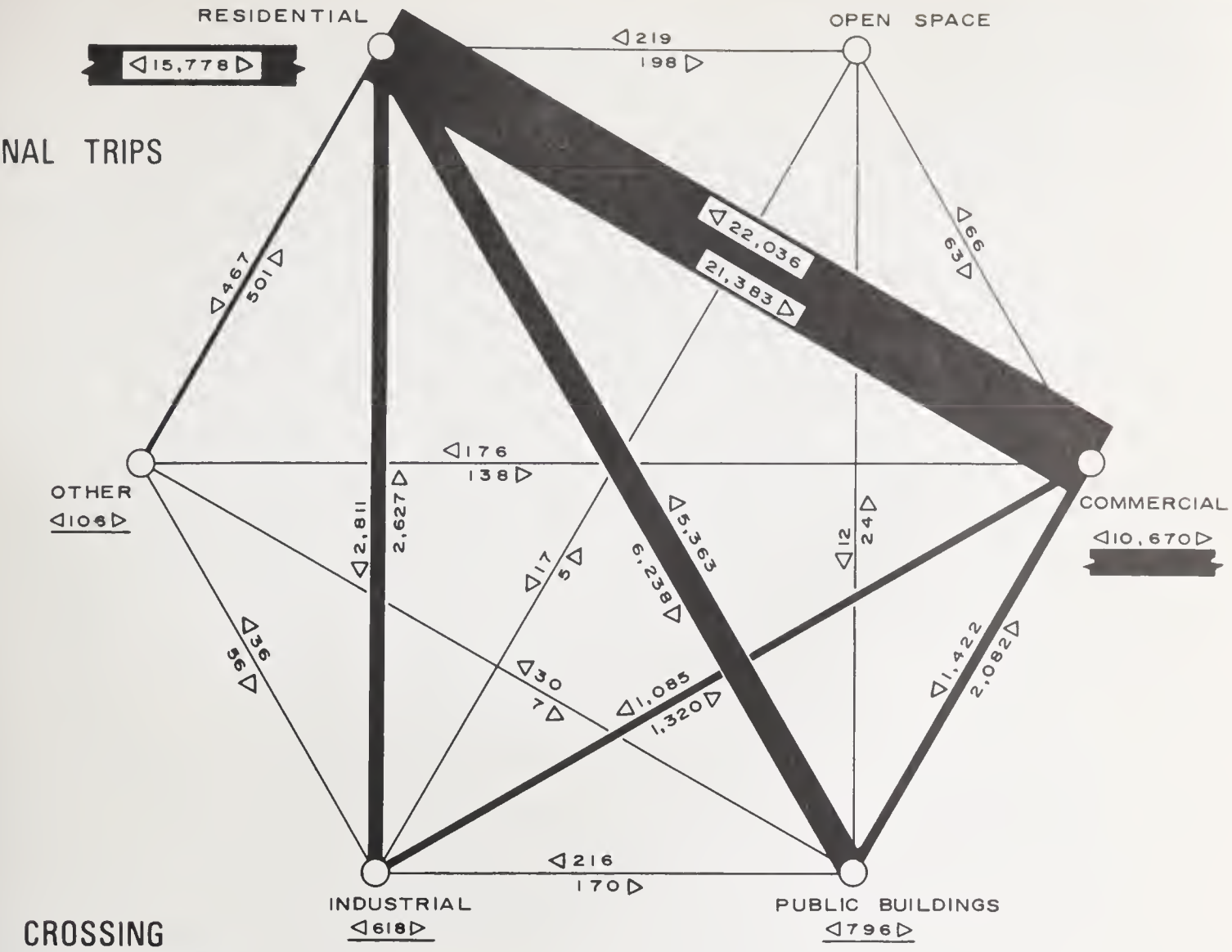
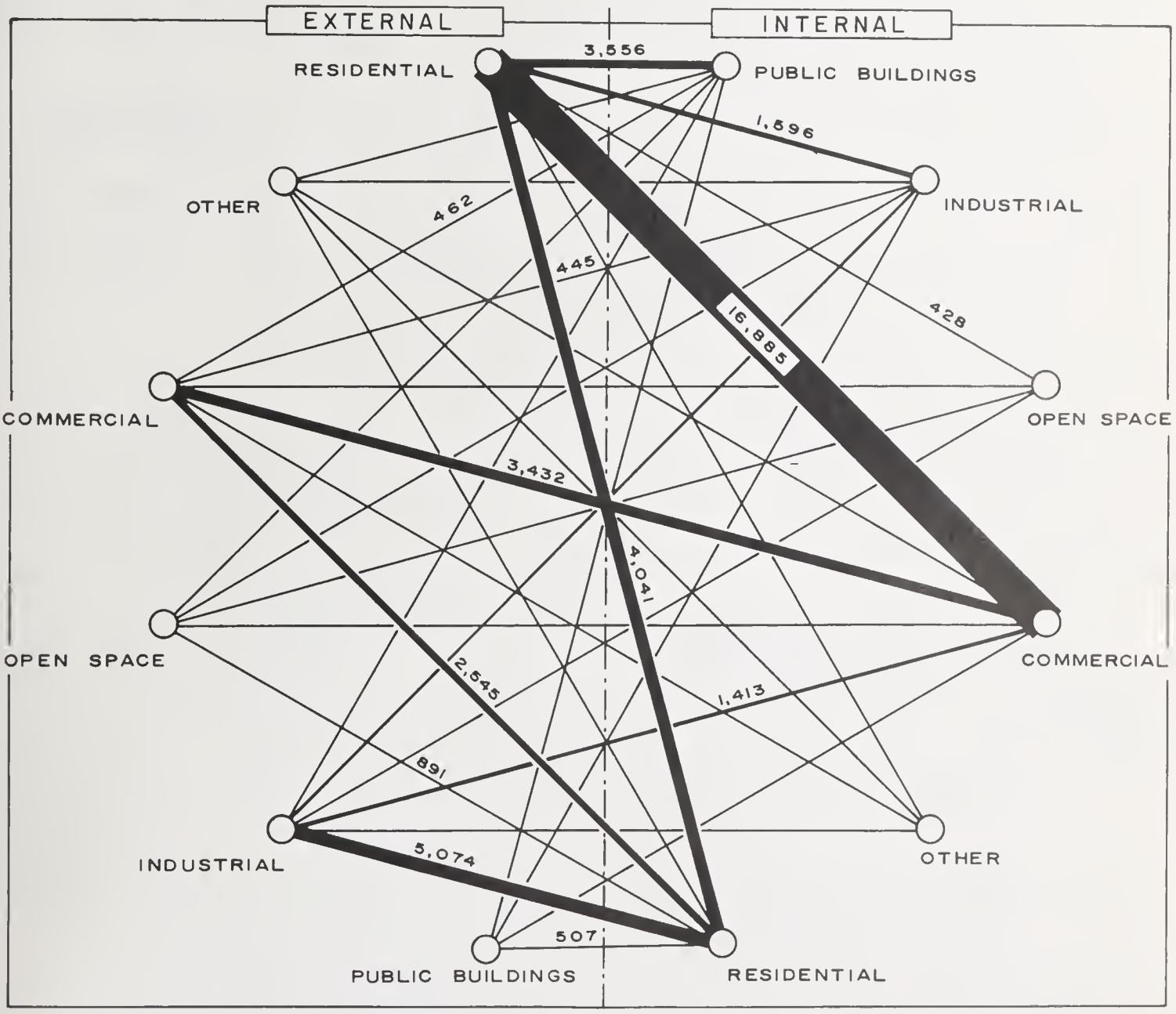


EXHIBIT A·3(



a) INTERNAL TRIPS

b) TRIPS CROSSING THE EXTERNAL CORDON

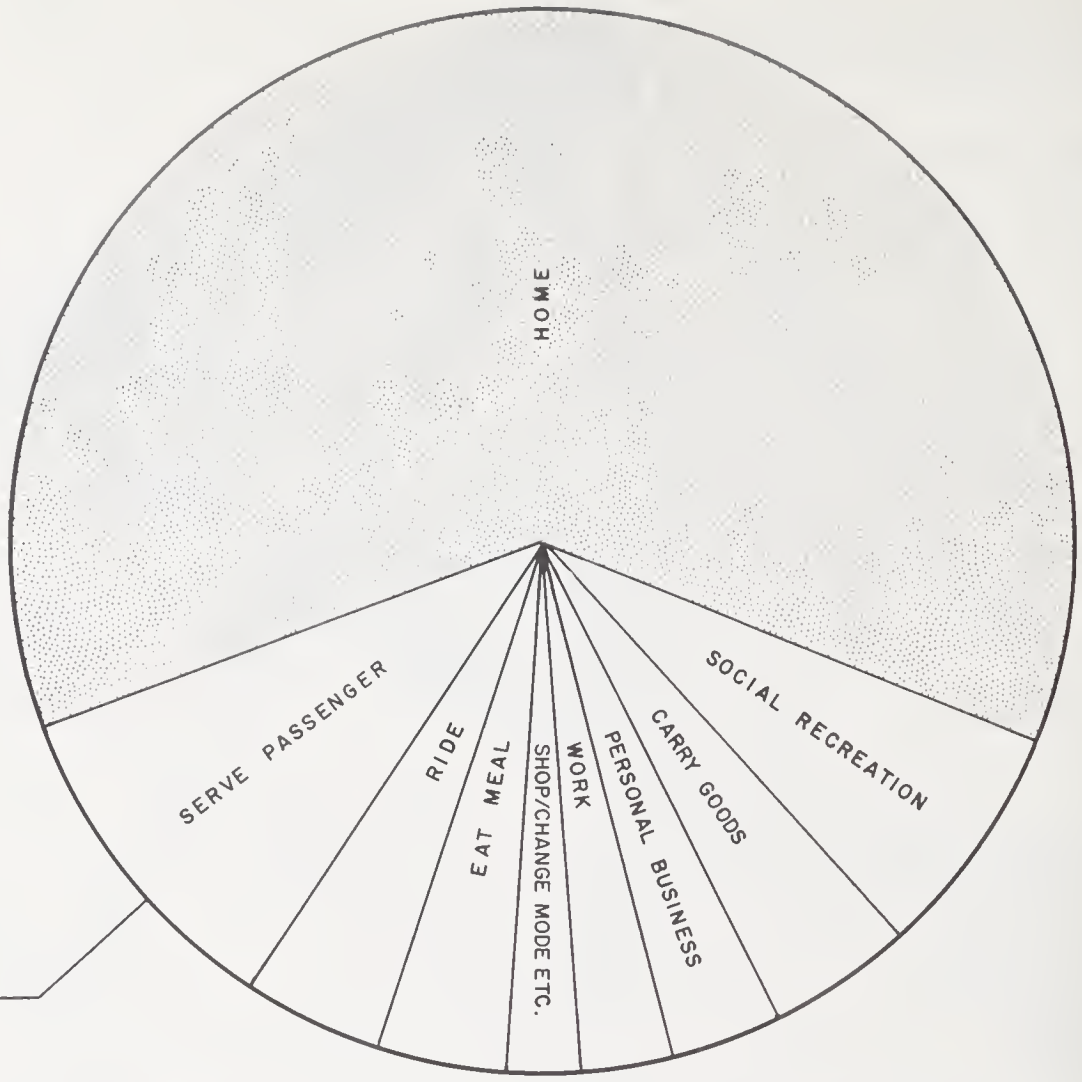


TRIP INTERCHANGE

BETWEEN MAJOR LAND USES

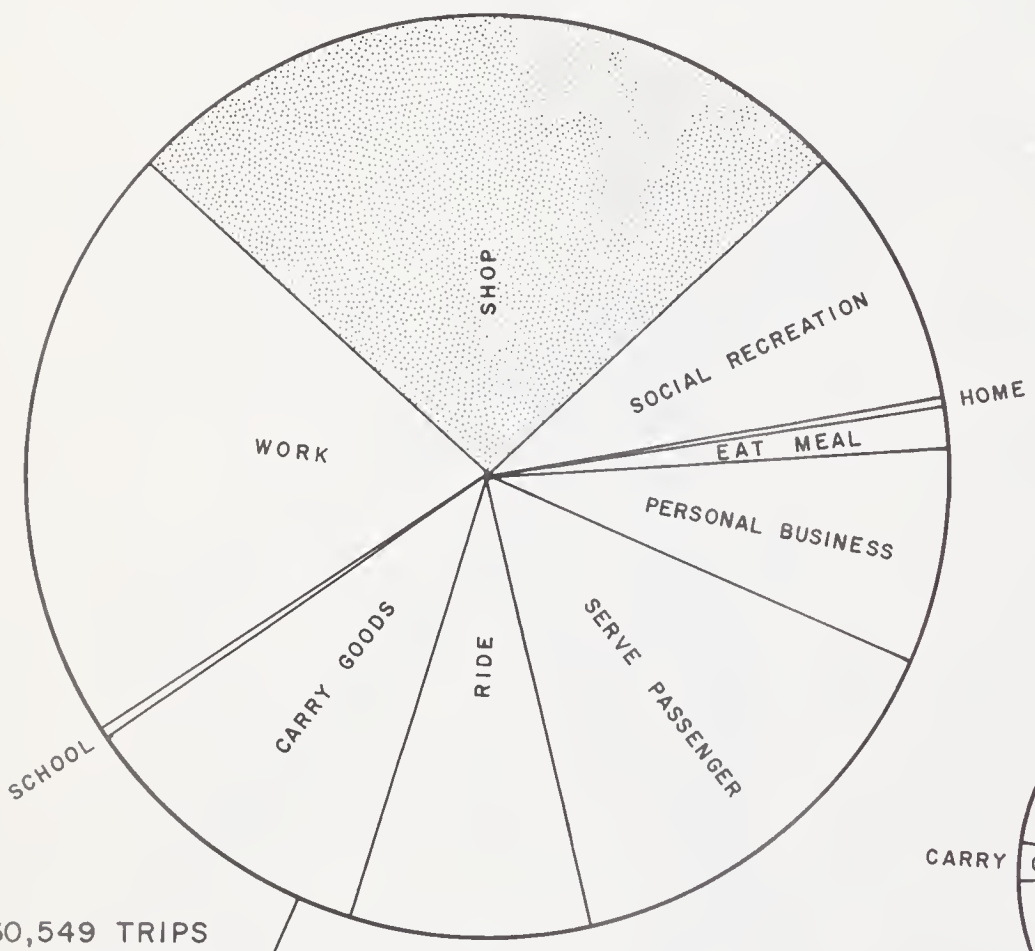
86,075 TOTAL
AUTOMOBILE and TAXI TRIPS

· as reported in the Home Interview and Taxi Interview Surveys.



43,562 TRIPS
TO
RESIDENTIAL
LAND USE

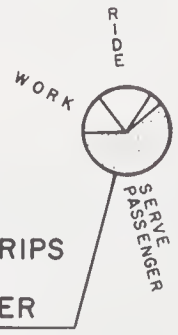
CORELATION BETWEEN REPORTED TRIP PURPOSE AND LAND USE AT DESTINATION



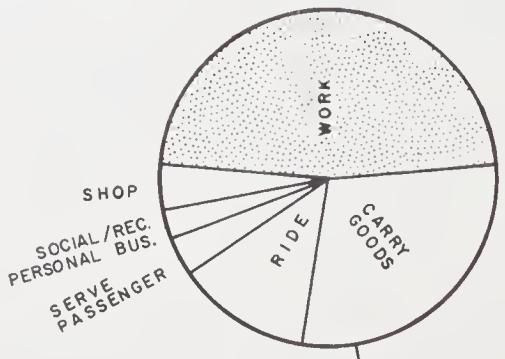
30,549 TRIPS
TO
COMMERCIAL
LAND USE

8,079 TRIPS
TO
PUBLIC BLDGS.
(GOVERNMENT OFFICES, SCHOOLS, HOSPITALS, ETC.)

279 TRIPS
TO
OPEN SPACE



792 TRIPS
TO
OTHER



2,812 TRIPS
TO
INDUSTRIAL
LAND USE

PROCEDURE FOR PROJECTION OF 1985 VEHICLE TRIPS

A widely used method of projecting future trip patterns is to apply a simple growth factor to each of the existing traffic zones under study. This method was rejected for the Sudbury study for a number of reasons, some of which may be stated as follows:

- considerable data were available from the surveys to indicate the attraction of trips on the basis of different purposes. Such data could not have been utilized if simple zonal expansion factors had been the basis of projection.
- all components of zone-residential population, commercial and industrial uses within a given O-D zone do not grow uniformly.
- in spite of studied attempts to achieve homogeneity of land use in defining zones, some intermixing of land use within a zone is inevitable.
- by developing trip attraction and/or production factors, better estimates can be made of future trips in zones in which existing land use is very sparse, but in which substantial development is expected to take place in the future.

The second method which was explored as a basis for estimating future trips involved subdividing trips according to purpose. The three trip purposes Home-to-Work, Home-to-Other and Non-Home-Based were extracted and analyzed. However, several difficulties were encountered when attempts were made to establish projections based upon this breakdown:

- many of the existing work opportunities are exterior to the Sudbury cordon, and growth factors relevant to these jobs were somewhat difficult to evaluate.
- the method can be simplified by the assumption that the reverse trips Work-to-Home and Other-to Home duplicate the trips Home-to-Work and Home-to-Other but there are several reasons to believe that this is a less reliable assumption in the case of Sudbury than elsewhere. The limitations of the external cordon data (inbound interviewing only, from 7 a.m. to 7 p.m.) did not permit these doubts to be resolved.
- the portion of the trips which could be most accurately expanded by this method would be work trips, but the 24-hour study in Sudbury indicated that work trips accounted for less than 20% of the total trips throughout the area.
- broad assumptions would have to be made, in order to relate trips of a given purpose to the known land uses.

After due consideration of the above possibilities, analysis based upon trip purpose was discarded in favour of analysis based upon reported land use at trip origin. The most compelling reason for adopting land use as the criterion for trip expansion was the fact that data concerning projected area growth was available in terms of projections of land use, from the Technical Coordinating Committee. The procedure was to subdivide 1963 reported trips by zone of origin and by reported land use at origin: expansion factors were applied to the trips associated with each land use within each zone of origin, and the whole was re-assembled by zone to give estimates of total

1985 trips. The results of this process are shown in Exhibit A.E, in the technical appendix. The total 1985 trips estimated by this method were compared with an approximate figure for 1985 trips calculated as the product of 1963 trips and the overall projection of population growth. Since these two figures were in close agreement, the zonal totals thus obtained were adopted without further modification.

After producing the 1985 trip table, it was realized that, although the division of the City into 83 zones should give rise to sound route assignments, this array was too complex to permit graphical analysis of desire lines. The 83-zone trip tables were therefore compressed into two smaller formats:

(i) The City based upon 29 DISTRICTS
(ii) The City and surrounding population centres based upon 19 REGIONAL AREAS

Hence, from the 1963 and 1985 83-zone trip tables, a 29-district trip table and a 19-region trip table were prepared. In the case of the 19-region table, some re-analysis of external cordon data was required to separate long distance trips from those associated with nearby population centres. All 1963 and 1985 trip tables are presented in Exhibits A.D and A.F in the appendix.

TRAVEL DAY [1] | SAMPLE NUMBER [2][3][4][5]

ADD DWELLING UNIT LOCATION [6][7][8][9][10]

IN COL. 11 PUNCH ZERO

SUDBURY TRAFFIC SURVEY - INTERNAL TRIP REPORT

A	B	C	D	E		F		G		H	I		J	K	L
Person Number	Trip Number	Where Did This Trip Begin? (Trip Origin)	Where Did This Trip End? (Trip Destination)	Trip Purpose (See Below)		Land Use (See Major Land Use Categories Below)		Time of Trip		Mode Of Travel	Blocks Walked To Or From Bus Stop R.R. Sto., Automobile, Etc.		Public Transport Users	Automobile Drivers	
				From	To			Beginning	Ending				Transfer Used	No. Of Pass. Incl. Driver	Kind Of Parking (See Below)
[12][13]	[14][15]	ESTABLISHMENT / STREET AND NUMBER [16][17][18][19][20]	ESTABLISHMENT / STREET AND NUMBER [21][22][23][24][25]	[26]	[27]	ACTIVITY AT ORIG. [28]	ACTIVITY AT DEST. [29]	___ A.M. ___ P.M. [30][31][32]	___ A.M. ___ P.M. [33][34][35]	[36]	AT ORIG. [37]	AT DEST. [38]	1. USED 2. D.N. [39]	[40]	[41]
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		
		ESTABLISHMENT / STREET AND NUMBER	ESTABLISHMENT / STREET AND NUMBER			ACTIVITY AT ORIG.	ACTIVITY AT DEST.	___ A.M. ___ P.M.	___ A.M. ___ P.M.		AT ORIG.	AT DEST.	1. USED 2. D.N.		

SUDBURY TRAFFIC SURVEY - DWELLING UNIT SHEET

TRAVEL DAY [1] | SAMPLE NUMBER [2][3][4][5]

HOUSEHOLD BEFORE / SAMPLE HOUSEHOLD / HOUSEHOLD AFTER

A. STRUCTURE TYPE: [11]
1. Single Family 2. Two-Family 3. Multi-Family 4. Rooming House 5. Hotel 6. Motel 7. Institution 8. Trailer 9. Other(specify)_____

B. NUMBER OF PERSONS COMPRISING UNIT: [12][13]

C. NUMBER OF PERSONS 5 YEARS OF AGE & OLDER IN UNIT [14][15]

D. NUMBER OF PASSENGER CARS OWNED BY PERSONS WHO ARE PART OF THIS UNIT [16]

E. NUMBER OF LIGHT TRUCKS OWNED BY PERSONS WHO ARE PART OF THIS UNIT (NOTE: A LIGHT TRUCK IS DEFINED AS A 2 AXEL SINGLE-TIRED, TRUCK.) [17]

F. TOTAL UNIT INCOME: NOTE: ASK THIS QUESTION LAST. [18]
1. Less than $1,000 2. $1,000 to $1,999 3. $2,000 to $2,999 4. $3,000 to $3,999 5. $4,000 to $4,999 6. $5,000 to $5,999 7. $6,000 to $7,999 8. $8,000 to $9,999 9. $10,000 & Over

DWELLING UNIT LOCATION [6][7][8][9][10]

ADMINISTRATIVE RECORD

A. INT. NO._____

B. Contact Record:

DATE	TIME	DESCRIBE
1.		
2.		
3.		
4.		
5.		

C. Report Completed: I certify that all information on this form is correct and true.

DATE SIGNATURE

D. Report Submitted Incomplete:
1. Reason:_____

DATE SIGNATURE

2. Supervisor's Comments:_____

DATE SIGNATURE

E. Field Edit: Fail ☐ Pass ☐ Date Initials

F. Office Edit: Fail ☐ Pass ☐ Date Initials

G. CODING DEPT.
1. Coded by:

DATE NUMBER INITIALS

2. Checked by:

DATE INITIALS

G. DATA FOR PERSONS 5 YEARS OF AGE AND OLDER;

A	B	C	D	E	F	G
Person No.	PERSON IDENTIFICATION (RELATIONSHIP TO HEAD)	AGE	DRIVER?	SEX	OCCUPATION	INDUSTRY OR BUSINESS
1	HEAD	[27]	[28]		[29]	[30]
2		[31]	[32]		[33]	[34]
3		[35]	[36]		[37]	[38]
4		[39]	[40]		[41]	[42]
5		[43]	[44]		[45]	[46]
6		[47]	[48]		[49]	[50]
7		[51]	[52]		[53]	[54]
8		[55]	[56]		[57]	[58]
9		[59]	[60]		[61]	[62]

SUMMARY DATA

A. Total No. of Trips Reported At This Address [19][20]

B. No. of Persons, 5 Years of Age & Older, Making Trips [21][22]

C. No. of Persons, 5 Years of Age & Older Making No Trips [23][24]

D. No. of Persons, 5 Years of Age & Older, With Trips Unknown [25]

E. Complete or Incomplete Interview Code (Office Use Only) [26]

SUDBURY AREA TRANSPORTATION STUDY

DILLON

HOME INTERVIEW REPORT FORMS

SUDBURY AREA
TRANSPORTION STUDY

Sheet ___ of ___

1963 TRUCK & TAXI REPORT

Travel Day: 1

Sample No.: 2 3 4 5

B TRIP NO.	C ORIGIN WHERE DID THIS TRIP BEGIN?	D DESTINATION WHERE DID THIS TRIP END?	E TRIP PURPOSE	F LAND USE	G TIME OF TRIP Beginning	G TIME OF TRIP Ending	H MODE
14 15	Establishment / Street and Number 16 17 18 19 20	Establishment / Street and Number 21 22 23 24 25	26 Carrying materials or goods / Carrying passenger(s) / Travelling empty — IN 27 PUNCH 0	FROM TO 28 29	___a.m. ___p.m. 30 31 32	___a.m. ___p.m. 33 34 35	IN 36 PUNCH 0
	Establishment / Street and Number	Establishment / Street and Number	Carrying materials or goods / Carrying passenger(s) / Travelling empty		___a.m. ___p.m.	___a.m. ___p.m.	
	Establishment / Street and Number	Establishment / Street and Number	Carrying materials or goods / Carrying passenger(s) / Travelling empty		___a.m. ___p.m.	___a.m. ___p.m.	
	Establishment / Street and Number	Establishment / Street and Number	Carrying materials or goods / Carrying passenger(s) / Travelling empty		___a.m. ___p.m.	___a.m. ___p.m.	
	Establishment	Establishment	Carrying materials or goods		___a.m.	___a.m.	

SUDBURY AREA
TRANSPORTATION STUDY

TRUCK & TAXI REPORT

1963

Sheet 1 of ___

CONFIDENTIAL - The information obtained in this survey will be accorded confidential treatment. Individual reports will be used for statistical purposes only.

SECTION I IDENTIFICATION

OWNER

ADDRESS

VEHICLE DESCRIPTION

REGISTRATION NO.

DRIVER

TRAVEL DAY: 1

SAMPLE NO.: 2 3 4 5

VEHICLE TYPE
1. Passenger Vehicle
2. Light 2 axle-pickup or panel
3. Light 2 axle-single unit truck (single rear tires)
4. Heavy 2 axle
5. Transport (combination units)
6. Bus - common carrier
7. Bus - other (school, etc.)
8. Taxi
9. Heavy 3 axle-single unit truck

Entered: 6

GARAGE ADDRESS

TOTAL TRIPS THIS VEHICLE

16 17 18 19 20 / 14 15 } NOT PUNCHED

SECTION II ADMINISTRATION

INTERVIEWER(s)

CONTACT RECORD

Date	Time	Remarks

Report Completed:

I certify that all the information on this form is correct and true

Date Signed

Report Submitted Incomplete:

Reason

Date Signed

Supervisor's Comments

Date Signed

Field Edit

Date Signed

Office Edit

Date Signed

Coded

Date Signed

Checked

Date Signed

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

TRUCK and TAXI REPORT FORMS

FORM PL-TS-34
63-328

DEPARTMENT OF HIGHWAYS ONTARIO

O-D SURVEY

EXTERNAL INTERVIEWS

TRAFFIC AND PLANNING STUDIES SECTION

SHEET NO. 3 4 5	CITY 6 7 8	STATION 9 10 11	HOUR ENDING 16 17

VEHICLE TYPE	NO IN VEHICLE	WHERE DID THIS TRIP BEGIN (ORIGIN)	TYPE OF ESTABLISHMENT AT ORIGIN	WHERE WILL THIS TRIP END (DESTINATION)	TYPE OF ESTABLISHMENT AT DESTINATION	TRIP PURPOSE	HOME BASE AT
21 22	23 24	25 26 27 28 29	30 31	32 33 34 35 36	37 38	39	40
21 22							
21 22							

FORM PL-TS-34
63-328

DEPARTMENT OF HIGHWAYS ONTARIO

EXT

SHEET NO. 3 4 5	CITY

VEHICLE TYPE	NO IN VEHICLE	WHERE DID THIS TRIP BEG (ORIGIN)
21 22	23 24	25 26 27 28 29
21 22	23 24	25 26 27 28 29
21 22	23 24	25 26 27 28 29
21 22	23 24	25 26 27 28 29
21 22	23 24	25 26 27 28 29
21 22	23 24	25 26 27 28 29

FORM PL-TS-35
JUNE 1963

DEPARTMENT OF HIGHWAYS ONTARIO

TRAFFIC AND PLANNING STUDIES SECTION

O-D TRAFFIC SURVEY

EXTERNAL SURVEY

HOURLY SUMMARY

CITY _____ 8 7 8

STATION _____ 9 10 11

DATE OF INTERVIEW _____ 12 13 14 15 (DAY / MONTH)

HOUR ENDING _____ 16 17

DIRECTION OF TRAVEL _____ 18

YEAR OF SURVEY _____ 79 80

PARTY CHIEF _____

NUMBER OF INTERVIEWS IN THE HOUR _____

CORRESPONDING MANUAL COUNT _____

21 22	23 24	25 26 27 28 29	30 31	32 33 34 35 36	37 38	39	40

VEHICLE TYPE
1 PASSENGER VEHICLE
2 LIGHT 2 AXLE-PICKUP OR PANEL
3 LIGHT 2 AXLE-SINGLE UNIT TRUCK (SINGLE REAR TIRE)
4 HEAVY 2 AXLE-SINGLE UNIT TRUCK (DUAL REAR TIRE)
5 TRANSPORT (COMBINATION UNITS)
6 BUS-COMMON CARRIER
7 BUS-OTHER (SCHOOL, ETC.)
8 TAXI
9 HEAVY 3 AXLE-SINGLE UNIT TRUCK

TYPE OF ESTABLISHMENT
1 RESIDENTIAL
2 COMMERCIAL
3 INDUSTRIAL
4 PUBLIC BUILDINGS
5 RECREATIONAL OR RESORT AREA
6 OTHER (SPECIFY)

TRIP PURPOSE
1 WORK
2 TRANSACT BUSINESS
3 MEDICAL-DENTAL
4 SCHOOL
5 SOCIAL RECREATION
6 CHANGE MODE OF TRAVEL
7 SHOPPING
8 OTHER (SPECIFY)

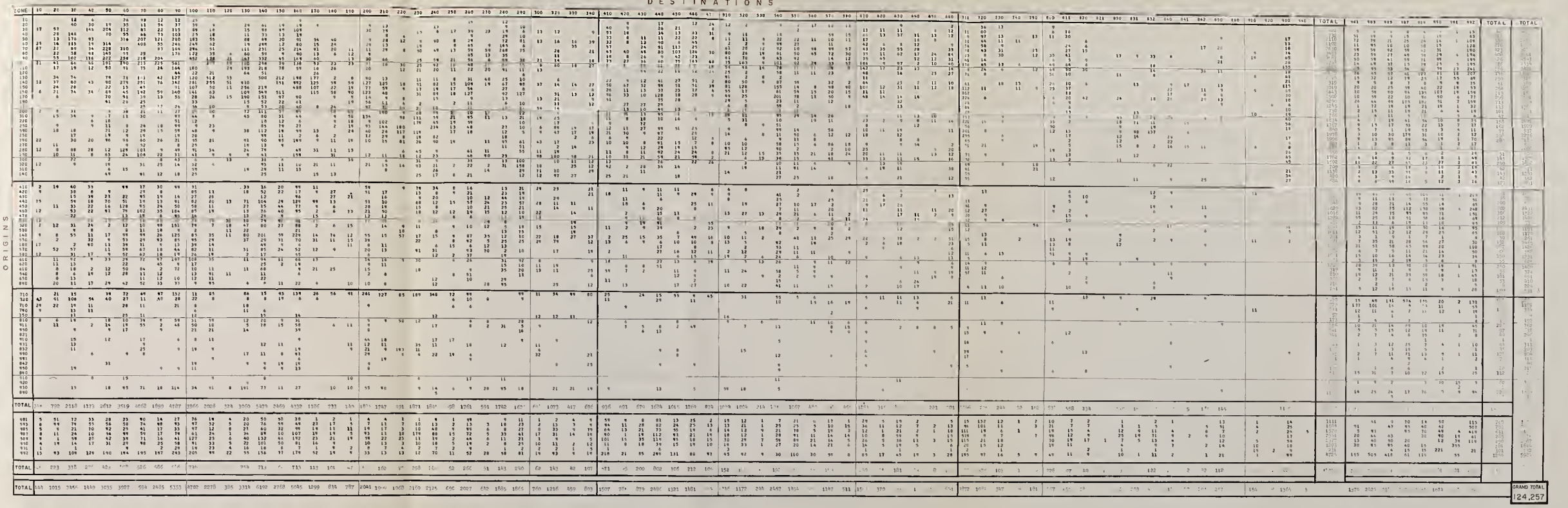
HOME BASE AT
1 ORIGIN
2 DESTINATION
3 NEITHER O. OR D.

INTERVIEWER _____

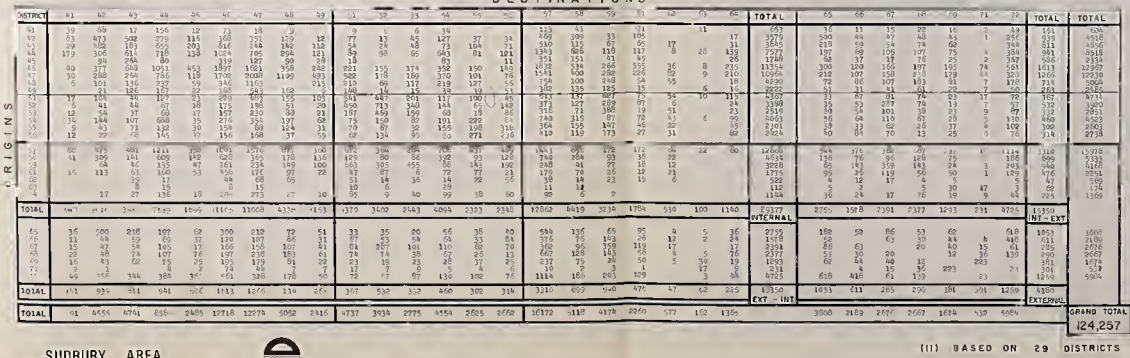
SUDBURY AREA TRANSPORTATION STUDY

DILLON

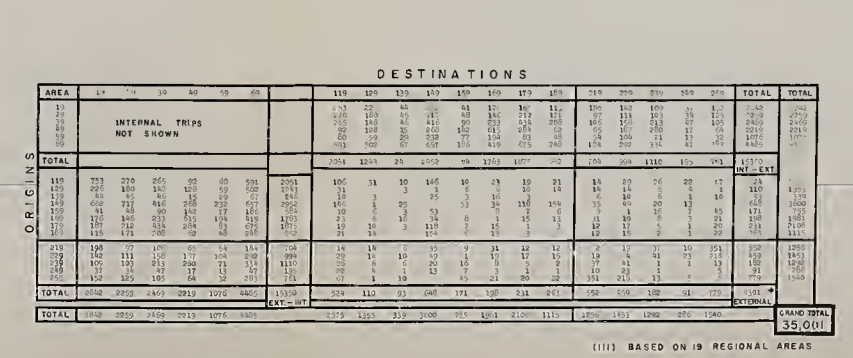
EXTERNAL CORDON INTERVIEW FORMS



(I) BASED ON 63 ZONES



(II) BASED ON 29 DISTRICTS



(III) BASED ON 19 REGIONAL AREAS

1963 TRIP TABLES

FOR AN AVERAGE WEEKDAY

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT A 0

LAND USE

TRIP GENERATION BY LAND USE

Location	Zone	Dist.	Area	Major Land Use 1985 Type	Residential Population 1985 Persons	Ratio	Commercial Floor Space 1985 Area*	Ratio	Industrial Employment 1985 Persons	Ratio	Other Land Use
Vale Lake	10	41	19	Res	Res	720	1605	4.65	-	8.2 Ac	18	1	1.1
Liverpool East	20	42	19	Res	Res	1150	2720	2.36	0.3 Ac	4.1 Ac	-	-	-
	30	42	19	Res	Res	2070	5100	2.46	0.8 Ac	3.8 Ac	-	-	-
	40	43	19	Res	R/Com	2350	5000	2.30	0.8 Ac	5.8 Ac	15	15	-
Liverpool West	50	43	19	Res	Res	3100	3640	1.15	1.8 Ac	5.8 Ac	-	-	-
	60	44	19	Res	Res	1150	1250	1.05	0.2 Ac	4.1 Ac	-	-	-
Lasalle	70	44	19	Res	Res	3710	4850	1.80	0.9 Ac	3.9 Ac	56	56	-
	80	45	19	Res	R/Ind	3600	5900	1.97	0.8 Ac	4.8 Ac	100	100	-
Coniston	90	45	19	Res	R/C	5930	7200	1.05	5.6 Ac	6.0 Ac	145	-	-
West End	100	46	29	Res	R/C/I	2720	7280	1.06	0.2 Ac	9.2 Ac	357	456	-
	110	46	29	Res	Res	2400	3060	1.28	0.2 Ac	2.3 Ac	92	92	1.0
	120	46	29	Res	R/C	760	1140	1.30	0.5 Ac	0.9 Ac	18	18	1.0
Donovan	130	47	39	Res	R/C	4080	5280	1.30	1.3 Ac	6.5 Ac	25	25	1.0
	140	47	39	Res	R/C/I	3820	4110	1.08	1.3 Ac	7.1 Ac	210	210	-
	150	48	39	Res	R/C	1100	1070	0.98	0.5 Ac	1.8 Ac	94	94	1.0
Flour Mill	160	48	39	Res	R/C	5400	4970	0.89	4.5 Ac	7.9 Ac	87	87	1.0
Western Heights	170	49	39	Res	R/C/I	1660	1760	1.27	-	1.3 Ac	-	-	-
	180	49	39	Res	R/C	790	1030	1.30	1.0 Ac	0.8 Ac	-	-	-
New Sudbury West	190	50	39	Res	R/C	1410	1410	1.00	1.8 Ac	2.8 Ac	-	-	-
	200	51	49	Res	Res	2300	4080	1.78	2.5 Ac	3.7 Ac	15	15	1.0
	210	51	49	Res	Res	2300	5190	2.26	12.9 Ac	9.4 Ac	-	-	-
New Sudbury East	220	52	49	Res	R/C	1400	4060	2.90	-	2.1 Ac	-	-	-
	230	52	49	R/C/O1	R/C/O1	2560	6030	2.37	8.4 Ac	9.9 Ac	8	8	1.0
New Sudbury South	240	53	49	Res	R/C	2760	5230	1.90	1.3 Ac	1.3 Ac	-	-	-
	250	53	49	R/C2	R/C2	1420	5810	2.97	-	8.7 Ac	17	17	1.0
	260	54	59	C/Com	C/Com	980	1850	1.35	21.1 Ac	2.5 Ac	-	-	-
River-Kingsway	270	54	59	Res	Res	1110	1510	1.36	0.4 Ac	1.6 Ac	106	106	1.0
	280	54	59	Res	R/C	2900	3110	1.07	1.0 Ac	-	24	24	1.0
Kingsway Lake West	290	55	59	R/C	R/C2	3140	3710	1.18	6.6 Ac	2.8 Ac	-	-	-
	300	55	59	R/C2	R/C2	1750	3170	1.81	12.8 Ac	6.2 Ac	-	-	-
Kingsway Lake East	310	56	59	Res	R/C	1660	3470	2.09	0.9 Ac	2.8 Ac	7	7	-
	320	56	59	R/C	R/C2	1580	1840	1.16	0.8 Ac	1.1 Ac	-	-	-
	330	57	59	Res	Res	1480	1530	1.03	4.5 Ac	1.1 Ac	-	-	-
Sub-Total (Residential)						77350	112600	1.46	100.4 Ac	133.6 Ac	1000	1000	-
(CD)	(Fire Hall, Zellers)	810	61	69	Com	Com	100	80	1.0	176	176	-	-	-	1.18
(CD)	(Protestant Hotel site,)	820	61	69	Com	Com	150	100	0.7	185	240	-	-	-	1.30
(CD)	(Chinaman site,)	830	61	69	Com	Com	50	50	1.0	176	203	-	-	-	1.15
(CD)	Woolworths, O.K.D.)	840	61	69	Com	Com	50	50	1.0	325	351	-	-	-	0.71
(CD)	Eaton's	850	62	69	C/Com	C/Com	50	50	1.0	113	176	-	-	-	1.56
(CD)	City Hall)	860	62	69	Com	Com	50	90	1.0	205	252	-	-	-	1.23
(CD)	Lorne Bus Station)	870	62	69	Com	Com	-	-	-	1411	1152	-	-	-	0.82
(CD)	Surety (Jarl)	710	57	69	Com	Com	50	50	1.0	169	209	210	210	-	1.24
(CD)	Lorlew (Mixed Use)	720	57	69	Com	Com	50	50	1.0	153	213	-	-	-	1.39
(CD)	Lorlew (Mixed Use)	730	57	69	Com	Com	-	-	-	28	26	-	-	-	0.93
(CD)	(Tel Tel, Caprera)	740	57	69	Com	Com	-	-	-	64	64	-	-	-	1.00
(CD)	Borgia)	640	57	69	Com	Com	150	130	0.78	283	323	-	-	-	1.14
(CD)	(Dion Bus, CNC)	650	57	69	Com	Com	100	50	1.0	93	93	-	-	-	1.00
(CD)	Sudbury Hydro)	660	57	69	Com	Com	130	130	1.0	70	302	-	-	-	4.31
(CD)	(Mixed Motors)	670	58	69	C/Com	C/Com	-	-	-	210	210	-	-	-	1.00
(CD)	Sudbury Arena)	680	62	68	C/Com	C/Com	80	40	1.0	142	142	-	-	-	1.00
(CD)	(President Hotel)	710	61	69	Com	C/R	100	100	1.0	176	176	-	-	-	1.00
(CD)	(GM, YMCA)	620	58	68	C/R	C	100	100	1.0	40	100	-	-	-	2.50
(CD)	Fed Credit Union)	630	58	68	C/R	C/R	100	100	1.0	28	220	-	-	-	7.86
(CD)	(Civic Car Park)	640	58	69	C/R	Pub	100	100	1.0	76	591	-	-	-	7.78
(CD)	(Jackson Funeral)	650	58	69	R/C	R/C	100	100	1.0	76	-	-	-	-	0.00
(CD)	(Fair Dairy)	660	58	69	R/C	R/C	500	500	1.0	63	24	-	-	-	0.38
Sub-Total CBD						1850	2480	0.85	2727	6146	210	210	-	2.25
	New Sudbury Shopping Centre	710	49	49	Com	Com	100	100	1.0	280	348	24	24	1.21
	Plaza 69	720	42	19	C/R	C/R	100	550	5.5	37	210	-	-	1.84
	Laurentian University	730	41	19	R/Com	Pub	50	1550	30.0	-	-	-	-	-
	Bell Park	740	44	19	O	O	-	-	-	-	-	-	-	-
	Oakwood Dr. Subdivision	750	61	69	O5/R	R/C	300	400	1.33	-	-	-	-	-
	CPR Industrial	810	61	69	Ind	Ind	-	-	-	-	-	900	2900	3.22
	CPR Station	820	58	69	I/C	I/C	-	-	-	-	-	100	100	1.00
	Notre Dame Ind.	830	49	39	OS/C	Ind	150	150	1.0	-	-	104	890	8.56
	Future Ind.	831	49	49	OS	Ind	-	-	-	-	-	117	690	5.90
	Hollwood	832	49	49	Ind	Ind	-	-	-	-	-	68	840	12.35
	LCSO, Pina	833	49	49	I/C/R	Ind	200	200	1.0	-	-	8	1150	5.75
	Raimbow Gardens	834	49	49	I/C	Ind	50	50	1.0	-	-	159	1120	7.05
	Invercell Road	840	60	49	Ind	Ind	-	-	-	-	-	-	1040	-
	Falconridge Rd. Ind.	841	60	49	Ind	Ind	-	-	-	-	-	-	300	-
	City Dump	842	58	49	OS	Ind	-	-	-	-	-	-	960	-
	Valley Lake Rd. Ind.	843	61	49	Ind	Ind	-	-	-	-	-	107	1080	-
	Pina Ind	880	49	29	OS/I	Ind	-	-	-	-	-	-	710	-
	Nurse Pine	910	73	59	Mine	Mine	-	-	-	-	-	450	450	1.0
	Pakis Mine	920	63	39	Mine	Mine	-	-	-	-	-	6	6	1.0
	Wood, Cosia Mine	930	64	39	Mine	Mine	-	-	-	-	-	2000	2000	1.0
	Twin Game Preserve	940	48	49	OS	-	-	-	-	-	-	9	9	-
Sub-Total Comm-Ind						900	4950	3.16	317	348	50	5098	1.08	-
Main: 1	Long Lake Rd,	981	65	219										
"	" Hwy 69 South	983	63	219										
"	Hwy 17 East	985	63	219										
" 7	Falconbridge Hw	987	67	219										
" 9	Hwy 69 North	989	68	219										
" 10	Levack Rd.	990	69	249										
" 11	Clarabelle	991	71	259										
" 12	Hwy 17 West	992	72	259										
Sub-Total External Areas						4650	11700	1.56	-	-	750	10865	-	-
Total						86750	131350	1.51	-	-	2960	17171	-	-

* Note Commercial Floor Area in terms of square feet of floor space or in acres of land occupied (Ac)

TOTAL TRIPS BY LAND USE AT ORIGIN/DESTINATION

Residential 1985 Trips	Commercial 1985 Trips	Industrial 1985 Trips	Public Buildings 1985 Trips	Open Space/Others 1985 Trips	TOTAL TRIPS 1985 Trips	Ratio	Vehicle Growth	Estimated Total Trips 1985 Trips
1100	19	50	2	3	1174	1.07	+ 20%	1409
1480	67	412	65	74	2098	1.42	"	2518
3700	274	375	69	60	4478	1.21	"	5374
2470	191	350	22	30	3063	1.24	"	3676
1680	310	850	286	1000	4126	2.46	"	4951
2851	2811	777	690	8	7137	2.50	"	8564
3000	1000	265	538	131	5834	1.94	"	7001
1170	1474	800	102	6	3552	3.04	"	4262
3560	2640	1414	1700	158	9472	2.66	"	11366
1485	1270	1957	1960	1000	7672	5.17	"	9206
1766	2140	180	736	44	4866	2.76	"	5839
112	77	11	12	9	221	1.97	"	265
2180	2180	872	1000	30	6262	2.87	"	7514
2490	2650	1856	2100	222	9318	3.74	"	11182
1960	1870	852	805	77	5564	2.84	"	6677
2581	2300	1804	3170	517	10372	4.02	"	12446
1164	2950	84	142	71	4411	3.79	"	5293
686	761	146	148	18	1759	2.56	"	2111
523	481	177	177	6	1364	2.61	"	1637
1578	2826	217	388	13	5022	3.18	"	6027
1571	1556	339	238	18	3722	2.37	"	4466
1651	2330	52	262	9	4304	2.61	"	5165
1186	2810	2016	995	17	7024	5.92	"	8429
1704	1890	255	255	64	4168	2.45	"	5002
668	1810	58	108	35	2679	4.01	"	3215
1063	1170	1058	1058	89	5438	5.12	"	6526
584	738	8	225	21	1576	2.70	"	1891
1203	1060	488	24	24	2799	2.33	"	3359
1405	1860	200	150	22	3637	2.59	"	4364
1737	2800	51	1000	22	5610	3.23	"	6732
646	1865	68	500	25	3104	4.80	"	3725
519	1184	18	500	13	2234	4.30	"	2681
727	2558	51	138	3	3477	4.78	"	4172
34814	46673	16403	24408	2911	125309	3.62	+ 20%	150371
50	50	1134	1930	10	10	309	309	6	6	1494	1775	1.19	+ 20%	2130
28	28	88	111	1200	-	16	16	31	31	1374	1375	1.78	"	1650
21	21	766	1100	23	23	2	2	25	25	848	1171	1.38	"	1405
28	28	1710	1350	211	11	637	800	29	29	2431	2293	0.92	"	2751
11	11	1291	1369	9	9	181	50	11	11	1522	990	0.74	"	1188
23	23	1272	1370	9	9	181	50	11	11	1466	1463	0.98	"	1756
10	10	426	839	-	-	-	-	16	16	511	885	1.67	"	1062
42	42	888	2160	42	42	42	42	12	12	1128	2532	2.17	"	3038
17	17	1290	1550	50	50	6	6	13	13	1379	1616	1.39	"	1903
3	3	233	233	3	3	33	33	11	11	261	263	1.00	"	316
64	64	2271	2450	16	16	81	81	31	31	2465	2672	1.08	"	3206
48	48	1317	2230	32	32	16	16	1	1	1426	2327	1.63	"	2792
43	43	841	1210	3	3	89	89	13	13	998	1338	2.49	"	1606
-	-	1073	3060	-	-	144	144	-	-	1231	3204	2.60	"	3845
71	71	566	1240	72	72	13	13	-	-	822	1396	1.91	"	1732
40	40	978	1012	290	568	27	102	-	-	1475	2722	1.85	"	3114
130	130	976	1012	-	-	24	148	2	2	374	2327	6.22	"	2792
137	137	1161	2048	-	-	49	49	13	13	991	2756	2.80	"	6907
299	299	665	5425	5	5	-	-	13	13	418	4496	11.04	"	5940
90	90	266	4550	63	-	-	300	-	-	224	925	1.00	"	870
88	88	1206	126	6	6	43	43	2	2	41	4771	3.74	"	5725
796	2134	802	1460	129	1020	83	43	2	2	41	4771	3.74	"	5725
1417	1417	17930	30821	711	1821	1765	2237	236	238	22142	45434	2.05	+ 20%	54486
72	72	3634	6400	121	121	-	-	11	11	3867	4665	1.19	+ 20%	5595
173	809	918	1458	3	3	-	-	13	13	1107	2375	2.21	"	2850
8	773	112	112	10	10	154	700	52	52	314	1049	4.94	"	1979
-	-	31	31	-	-	-	-	54	54	54	61	1.00	"	73
178	189	-	-	-	-	-	-	13	13	192	194	1.01	"	233
24	24	379	923	348	850	-	-	-	-	1196	1797	1.71	"	2157
-	-	1218	1218	13	13	-	-	-	-	618	637	1.00	"	764
14	14	241	2000	38	316	-	-	-	-	296	2338	7.87	"	2746
-	-	-	-	1	1479	-	-	-	-	1	1480	864	"	1764
17	17	207	207	78	950	-	-	2	2	311	1176	3.78	"	1411
38	38	107	107	40	1190	11	11	9	9	203	1555	7.66	"	1866
157	157	135	135	100	1340	2	2	1	1	504	1616	3.24	"	1903
-	-	268	268	45	1240	-	-	-	-	314	1516	7.83	"	1819
-	-	8	8	32	380	-	-	-	-	40	368	9.20	"	447
26	26	26	26	100	436	24	24	38	38	215	549	2.55	"	659
8	8	51	51	155	2720	-	-	3	3	215	2780	12.94	"	3338
-	-	-	-	-	1080	-	-	-	-	-	1080	N.A.	"	1080
-	-	-	-	-	450	-	-	-	-	-	450	-	"	582
2	2	2	2	132	450	-	-	8	8	186	485	2.62	"	14
-	-	-	-	6	6	-	-	-	-	8	18	1.40	"	22
1212	2050	6	6	1	1269	-	-	2	2	1369	2206	1.61	"	2647
9	9	9	-	-	27	-	-	-	-	12	11	0.92	"	13
5	5	5	5	5	25	-	-	-	-	-	-	-	"	-
2000	2000	1.0	-	-	-	-	-	-	-	-	-	-	"	-
3535	16500	205	750	1177	177	10606	23409	2.70	+ 20%	25369
1102	1116	174	174	153	18	18	54	108	1101	1641	1.46	+ 20%	1969
1202	1202	600	600	215	215	53	54	84	84	1648	3369	2.20	"	2158
1866	1290	419	621	140	213	27	40	109	164	1578	2337	1.48	"	2804
1196	1734	378	577	69	989	114	174	35	53	2401	3527	1.47	"	4234
1876	2814	206	309	168	252	51	76	84	84	1893	1902	1.47	"	2282
927	1241	206	309	168	252	51	76	84	84	1893	1902	1.47	"	2282
22	22	9	9	201	201	-	-	2	2	211	241	1.05	"	289
2318	2790	63	317	1500	2554	51	51	112	112	4725	6113	1.14	"	7336
9709	12350	2414	3368	3104	4710	389	466	449	669	15390	21404	1.40	+ 20%	25685
41435	71241	44807	70414	8081	23451	6614	13380	1681	1836	120047	168814	1.67	+ 20%	238583

(I) DAILY

INTERNAL and INTERNAL - EXTERNAL TRIPS FOR 83 INTERNAL ZONES

Location	Zone	Dist.	Area	Local Traffic 1985 Trips	Ratio	Vehicle Growth	Total Local 1985 Trips	Through Traffic 1985 Trips	Ratio	Vehicle Growth	Total Through 1985 Trips
Chemalt, 9/218, 217, 218	981	65	119	2961	2731	1.40	+20%	4356	926	776	1.47	Included in Growth Factors	1702
Creighton, 97215, 247	992	72	149	1243	1371	1.27	"	1869	110	118	1.07		141
Lewis, 97210	990	66	179	2246	2310	1.34	"	3306	63	144	1.55		173
Copper Cliff, 97241	991/2	72	149	2552	3481	1.17	"	4156	648	696	1.07		835
Coniston, 97242	993	66	159	695	1419	1.63	"	835	171	176	1.03		211
Falconbridge, 97248, 261	987	67	169	1763	2862	1.46	"	3172	168	221	1.68		266
Hanmer, 97243, 267	987/9	68	179	1772	2954	1.55	"	3826	231	511	2.13		613
Azilda, 97245	990	69	189	852	1379	1.61	"	1650	263	281	0.17		337
Trips 3, 19981, 983	9813/5	63	219	794	875	1.24	"	1051	552	1805	2.18		1204
Trips 4, 19985	985	68	229	994	1482	1.63	"	1568	459	597	2.17		717
Trips M, 19987, 989	987/9	68	237	1110	1990	1.43	"	1909	182	223	1.23		268
Trips M.W., 19990	990	69	249	193	200	1.03	"	249	91	1200	13.14		1440
Trips N, 19992, 992		72	259	701	1437	1.89	"	1715	779	1466	1.88		1759
Total External Areas				14456	21434	1.40	+20%	25728	4361	8407	1.44		10088

(II) DAILY

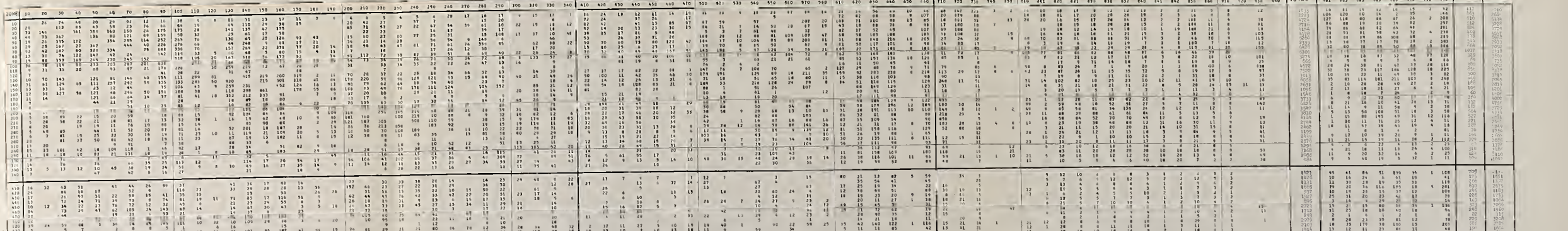
EXTERNAL - INTERNAL and EXTERNAL (THROUGH) TRIPS FOR 13 EXTERNAL REGIONS

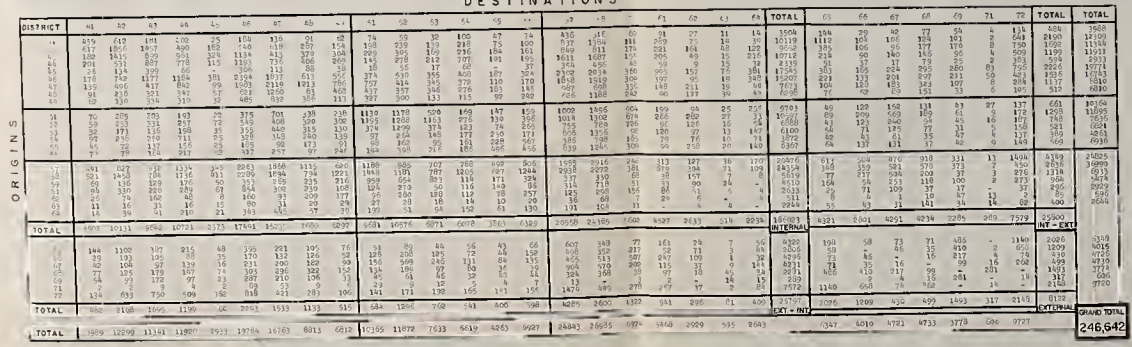
ESTIMATION OF 1985 VEHICLE TRIPS

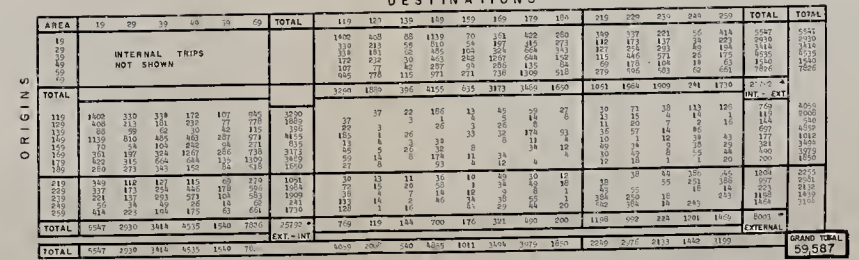
SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT A-E







NOTE: Trips shown in table (III) differ slightly from the figures in tables (I) and (II) because this table was projected independently

1985 TRIP TABLES

FOR AN AVERAGE WEEKDAY

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT A-F

VOLUMES, CAPACITIES and ACCIDENTS at MAJOR INTERSECTIONS

INTERSECTION	GRID NO. (SECTION)	APPROACH LEG FROM	PEAK PERIOD (2 HOUR) VOLUME	APPROACH WIDTH (FEET)	% GREEN TIME	PEAK HOUR APPROACH VOLUME V	PRACTICAL CAPACITY K	VOL/CAP RATIO(1) V/K	PEAK ½ HR. APPROACH VOLUME v	POSSIBLE ½ HR. CAP P	VOL/CAP RATIO(2) v/P	ACCIDENT EXPERIENCE 1962-64
evack Rd. Clarabelle Rd.	030-081 (1B-3)	N Levack S Levack W Clarab.	734 789 296		 Stop	204 155 203			55 35 96			
elly Lake Road Lorne Street	040-040 (1A-1)	E Lorne S Kelly W Lorne	2550 256 2564	20' 12' 20'	 Stop 	378 1219 49			87 441 7			1 (62) 11 (63)
ogan Avenue Lorne Street Damaris Crescent	050-042 (1A-3)	N Logan NE Lorne SW Lorne W Damaris	72 2786 2718 42	 20' 20' 15'	 Stop	 454 1266 4	one way northbound		 107 458 0			
artindale Road Lorne Street Ontario Street	059-048 (1A-4)	NE Lorne E Ontario S Martind. SW Lorne	2500 647 636 3001	21' 21' 23' 25'	61% 13% 29% 55%	470 123 73 1295	840 254 180 1310	0.56 0.48 0.40 0.99	115 32 19 394	250 76 54 390	0.46 0.42 0.35 1.01	34 (62) 31 (63) 28 (64)
thelbert Street Elm Street W.	063-070 (7D-1)	N Ethelb. E Elm S Ethelb. W Elm	141 421 101 401	17' 18' 16' 18'	Stop Stop 	27 101 24 170			11 23 10 39			
egent St. S. Bouchard Street Martilla Drive	066-026 (2A-3)	N Regent E Martilla S Regent W Bouchard	1552 5 1433 370	13' 10' 13' 12'	 Stop Stop	518 283 105			129 98 19			
egent Street S. Martindale Road Walford Road	068-030 (2A-3)	N Regent E Walford S Regent NW Martind.	1489 444 1610 359	12' 20' 12' 11'	 Stop Stop	489 108 301 116			106 36 86 32			15 (62) 18 (64)
egent Street S. York Street	069-046 (2A-5)	N Regent E York S Regent W York	1665 347 1470 224	20'5 18' 14'5 18'5	 Stop Stop	538 96 307 62			151 32 85 15			
egent Street S. McLeod Street Hyland Drive	069-050 (2A-5)	N Regent E Hyland S Regent W McLeod	1829 291 1724 657	21' 21' 21' 20'	51% 36% 51% 36%	597 46 369 283	990 575 990 575	0.60 0.08 0.37 0.49	148 15 142 94	310 180 310 180	0.48 0.08 0.46 0.52	10 (61) 28 (62) 14 (63) 25 (64)
egent Street S. Ontario Street Riverside Drive	069-055 (2A-6)	N Regent E Rivers S Regent W Ontario	1269 735 1678 337	21' 21' 20' 21'	45% 11% 19% 14%	430 238 370 123	1060 176 380 246	0.42 1.35 0.97 0.50	111 71 94 50	317 53 114 74	0.35 1.34 0.83 0.68	21 (62) 16 (63)
egent Street N. Beatty Street McKim Street Kathleen Street W.	069-079 (1C-5)	N Beatty E Kathleen S Regent W McKim	129 1330 1254 79	12' 18' 11' 15'	Stop Stop	27 372 380 28			8 119 115 8			24 (61) 14 (63)
egent Street S. Lorne Street	070-056 (1A-6)	E Lorne (S) " (L) S Regent SW Lorne	2766 1282 2036	11' 11' 16' 33'	45% 23% 100% 51%	474 371 285 757	706 192 800 821	0.67) 2.04) 0.36 0.92	224 73 234	268 240 257	0.84 0.30 0.92	16 (61) 74 (62) 56 (63) 52 (64)
egent Street S. Douglas Street W.	070-060 (1C-1)	N Regent E Douglas S Regent W Douglas	1353 1089 671 609	15' 12' 15' 12'	 Stop Stop	442 342 117 159			128 91 25 36			
egent Street S. Spruce Street	070-064 (1C-2)	N Regent S Regent W Spruce	1225 1205 598	15' 15' 18'	 Stop	358 349 160			114 99 40			11 (62)
egent Street Elm Street W.	070-070 (1C-3)	N Regent E Elm S Regent W Elm	1120 1015 1246 759	16' 21' 15' 19'	42% 44% 42% 44%	271 315 329 263	750 405 740 467	0.36 0.78 0.44 0.55	81 88 87 64	225 125 220 140	0.36 0.71 0.40 0.46	13 (61) 28 (62) 25 (63) 24 (64)
rood Road Kathleen Street W.	070-080 (14C-1)	N Frood E Kathl. S Frood W Kathl.	900 944 787 1331	17' 20' 19' 20'	 Stop Stop	304 230 158 420			65 58 56 132			
orne Street Douglas Street W.	071-060 (1A-7)	NE Lorne E Douglas SW Lorne W Douglas	2154 1380 2614 844	21' 19' 21' 16'5	63% 27% 63% 27%	548 373 934 194	1075 420 1010 405	0.51 0.89 0.92 0.47	136 94 282 63	320 105 305 125	0.43 0.89 0.93 0.50	12 (61) 38 (62) 31 (63) 23 (64)
rood Road Burton Avenue	071-091 (6B-5)	N Frood E Burton S Frood	561 160 565	11' 15' 11'	 Stop 	200 24 74			80 11 14			
iverside Drive Cross Street	072-056 (8C-2)	N Cross E Rivers W Rivers	612 789 1285	10' 17' 17'	Stop 	243 188 344			69 42 106			
egent Street Paris Street Long Lake Road	073-012 (2A-1)	N Regent E Paris S Regent W Long LK	1361 678 1282 455	12' 11' 12' 11'	60% 30% 60% 30%	506 225 274 75	580 250 580 225	0.86 0.90 0.47 0.33	120 69 80 31	174 78 174 68	0.69 0.88 0.46 0.46	16 (62) 13 (64)
orne Street Alder Street Hazel Street	073-062 (1A-8)	N Alder NE Lorne SW Lorne W Hazel	171 244	18' 21' 21' 22'	Stop Stop	43 53			10 19			19 (62)
orne Street Elm Street W.	076-070 (1A-10)	N Lorne E Elm S Lorne W Elm	1130 1354 2241 2342	19' 21' 19.5' 21'	27% 32% 27% 30%	308 635 750 389	615 610 745 495	0.49 1.04 1.01 0.79	90 181 233 117	192 198 233 122	0.47 0.93 1.00 0.97	11 (61) 41 (62) 27 (63) 26 (64)
College Street Lorne Street Frood Road	076-073 (6B-1)	N College E Frood S Lorne W Frood	1226 1456 1780 844	15' 18' 18' 18'	47% 32% 47% 32%	274 241 606 338	750 605 720 410	0.37 0.40 0.83 0.83	80 58 199 87	225 182 216 123	0.36 0.32 0.92 0.71	22 (62)
College Street Eva Street Kathleen Street W.	076-080 (14C-2)	N Eva E Kathleen S College W Kathleen	164 1674 995 1129	13' 15' 15' 22'	Stop Stop Stop Stop	44 437 361 323			15 120 123 86			12 (61)

EXHIBIT A·G
sheet 1 of 4

Volumes, Capacities and Accidents at Major Intersections (continued)

INTERSECTION	GRID NO. (SECTION)	APPROACH LEG FROM	PEAK PERIOD (2 HOUR) VOLUME	APPROACH WIDTH (FEET)	% GREEN TIME	PEAK HOUR APPROACH VOLUME V	PRACTICAL CAPACITY K	VOL/CAP RATIO(1) V/K	PEAK ½ HR. APPROACH VOLUME v	POSSIBLE ½ HR. CAP P	VOL/CAP RATIO(2) v/P	ACCIDENT EXPERIENCE 1962-64
Paris Street /Walford Road	077-030 (4C-3)	N Paris	790	12'		263			69			
		E Walford	143	11'	Stop	28			10			
		S Paris	799	11'		157			34			
		W Walford	380	20'	Stop	91			29			
Winchester Street /Wembley Drive	078-056 (13D-1)	N Winch	296	18'	Stop	108			42			
		E Wembley	330	15'		69			15			
		S Winch	83	15'	Stop	23			6			
		W Wembley	457	15'		123			26			
Frood Road /Beech Street W.	078-072 (6B-1)	N Frood	1344	16'		430			125			17 (61)
		E Beech	1165	21'	Stop	207			48			15 (62)
		S Frood	517	17'		151			35			21 (63)
		W Loblaw	82			39			8			16 (64)
Melvin Avenue /Mackenzie Street /Kathleen Street W.	078-080 (14C-2)	N Melvin	767	17'	Stop	177			49			14 (61)
		E Kathleen	1110	15'		287			85			
		S Macken.	554	18'	Stop	155			54			
		W Kathleen	1663	17'		552			165			
Perrault Street /Brady Street	079-063 (1T-1)	E Brady	1053	30'		620			169			
		S Perrault	906	16'	Yield	257			81			
		W Brady	1013	27'								
Frood Road /Elm Street W.	079-070 (6B-1)	N Frood	339	21'	Stop	134			33			
		E Elm	1522	21'		799			234			16 (62)
		W Elm	1448	21'		727			187			15 (63)
Paris Street /Ramsey Lake Road	080-037 (4C-4)	N Paris	1005	11'		289			69			
		E Ramsey	358	11'	Stop	150			90			
		S Paris	801	11'		150			32			
Lambton Court /Boland Avenue	080-050	N Lambton	27	15'		4			1			
		E Boland	121	17'		33			13			
		W Boland	110	22'		31			7			
Elgin Street S. /Larch Street	080-068 (2B-1)	N Elgin	1288	40'		734			205			10 (61)
		E Larch	498	20'	Stop	103			27			
		S Elgin	1156			one way southbound						14 (63) 15 (64)
Elgin Street /Elm Street	080-070 (1A-12)	N Elgin	1080		21%	595	900	0.65	160	270	0.59	
		E Elm	2091	21'	47%	619	990	0.85	159	218	0.72	30 (62)
		S Elgin	1353			one way southbound						29 (63)
		W Elm	2504	21'	47%	727	660	1.10	187	200	0.94	26 (64)
Elgin Street N. /Beech Street	080-071 (5B-1)	N Elgin	563	40'	27%	292	900	0.32	95	280	0.34	
		E Beech	1102	20.5'	27%	314	340	0.92	97	106	0.91	
		S Elgin	1006			one way southbound						
		W Beech	1127	21'	41%	410	530	0.77	106	166	0.64	
MacKenzie Street /Hospital Crescent /Elgin Street /Fir Street	080-073 (2B-1)	N MacKen.	842	20'		249			74			
		E Hospital	599	39'	Stop	347			106			
		S Elgin	522			one way southbound						
		W Fir	179			one way westbound						
Durham Street S. /Elgin Street S.	081-065 (2B-3)	N Durham	1035			one way northbound						
		SE Elgin	1629	22'		396			129			
		NW Elgin	1156	40'		669			192			
Durham Street S. /Cedar Street	081-069 (4B-1)	N Durham	1245			one way northbound						
		E Cedar	756	20'	23%	207	275	0.75	55	83	0.66	22 (62)
		S Durham	1231	41'	36%	656	1550	0.41	203	475	0.43	18 (63)
		W Cedar	634	20'	23%	171	220	0.77	59	66	0.88	25 (64)
Durham Street /Elm Street E.	081-070 (1A-12)	N Durham	1068			one way northbound						
		E Elm	2256	21'	42%	538	630	0.86	161	188	0.85	40 (62)
		S Durham	1684	40'	25%	873	910	0.95	233	274	0.85	34 (63)
		W Elm	2674	21'	42%	645	610	1.06	187	182	1.02	37 (64)
Durham Street N. /Hospital Crescent /Beech Street E.	081-077 (5B-1)	N Hosp.Cr.	638			one way northbound						10 (61)
		E Beech	1458	19'	45%	368	610	0.60	130	190	0.68	16 (62)
		S Durham	902	40'	25%	473	750	0.63	145	235	0.62	12 (63)
		W Beech	1044	20'	45%	220	540	0.41	80	170	0.47	14 (64)
Regent St. S. /Algonguon Road /Loach's Road	082-010 (2A-1)	N Regent	1100	11'		415			105			
		E Loachs'	403	11'	Stop	66			16			
		S Regent	630	11'		148			65			
		W Algon.	159	13'	Stop	46			11			
Paris Street /York Street	082-047 (6C-2)	N Paris	1127	23'		336			92			
		S Paris	961	23'		267			96			
		W York	320	18'	Stop	63			14			
Lisgar Street S. /Larch Street	083-068 (12C-1)	N Lisgar	1309	20'	Stop	362			102			
		E Larch	1664	21'	Stop	449			114			
		W Larch	941	20'	Stop	274			82			
Lisgar Street S. /Cedar Street	083-069 (12C-1)	N Lisgar	1061	20'	Stop	317			86			
		E Cedar	714	20'	Stop	203			59			
		S Lisgar	1069	20'	Stop	278			81			
		W Cedar	884	22'	Stop	229			77			
Lisgar Street /Elm Street E.	083-070 (1A-13)	N Lisgar	1613	20'	37%	389	407	0.95	99	122	0.80	11 (61)
		E Elm	2024	21'	51%	546	740	0.74	155	221	0.69	37 (62)
		S Lisgar	1479	20'	37%	344	440	0.78	104	132	0.78	22 (63)
		W Elm	2116	21'	51%	639	715	0.88	179	215	0.83	28 (64)
Lisgar Street N. /Notre Dame Avenue /Beech Street E.	083-071 (5B-1)	NE N.Dame (L)	1744	10'	21%	212	294	0.72	95	143	0.66	
		(S)		10'	13%	175	182	0.96				10 (61)
		S Lisg. (L)	1294	15'	21%	121	391	0.31	115	190	0.60	24 (62)
		(R)		15'	13%	239	242	0.98				21 (63)
		W Beech (S)	1402	10'	31%	311	434	0.72	150	185	0.81	15 (64)
		(R)		10'	13%	151	182	0.83				
Minto Street /Elgin Street S. /Van Horne Street	084-063 (2B-4)	N Minto	825	21'	36%	262	286	0.90	90	86	1.03	15 (61)
		E Van H.	153			one way eastbound						11 (62)
		SE Elgin	1595	22'	33%	399	703	0.56	126	210	0.59	13 (63)
		NW Elgin	1386	22'	51%	434	900	0.48	126	270	0.46	
Minto Street /Brady Street	084-065 (10C-1)	N Minto	2272	23'	23%	685	530	1.27	178	158	1.10	
		E Brady	856	18'	30%	233	605	0.42	65	165	0.39	33 (62)
		S Minto	957	20'	44%	254	725	0.34	91	218	0.43	24 (63)
		W Brady	2303	24'	48%	615	835	0.73	169	250	0.66	12 (64)

Volumes, Capacities and Accidents at Major Intersections (continued)

INTERSECTION	GRID NO. (SECTION)	APPROACH LEG FROM	PEAK PERIOD (2 HOUR) VOLUME	APPROACH WIDTH (FEET)	% GREEN TIME	PEAK HOUR APPROACH VOLUME V	PRACTICAL CAPACITY K	VOL/CAP RATIO(1) V/K	PEAK ¼ HR. APPROACH VOLUME v	POSSIBLE ¼ HR. CAP P	VOL/CAP RATIO(2) v/P	ACCIDENT EXPERIENCE 1962-64
Minto Street Larch Street	084-068 (10C-1)	E Larch S Minto W Larch	1727 2082 1649	21' 20' 21'	Stop Stop Stop	525 518 473			124 161 119			
Young Street S. Larch Street	085-068 (20D-1)	N Young E Larch W Larch	1084 1356 1714	21' 17' 20'	Stop	311 399 465			79 112 134			
Young Street S. Cedar Street	085-069 (12C-1)	N Young E Cedar S Young W Cedar	1014 643 877 859	21' 15' 21' 22'	Stop Stop Stop Stop	293 178 261 240			78 57 85 78			12 (62)
Young Street Elm Street E.	085-070 (1A-13)	N Young E Elm S Young W Elm	940 1735 1051 1702	13' 21' 20' 20'	36% 50% 36% 50%	259 447 427 463	275 605 375 740	0.93 0.73 1.13 0.60	75 110 129 158	83 182 142 185	0.90 0.61 1.13 0.68	12 (61) 33 (62) 22 (63)
Drinkwater Street Elgin Street S.	087-060 (2B-6)	N Drinkw. E Elgin W Elgin	145 1840 1749	35' 18' 18'		one way northbound 437 647			134 181			
Drinkwater Street Van Horne Street	087-063 (11C-1)	N Drinkw. E Van H. S Drinkw. W Van H.	660 481 229 376	16' 17' 35' 18'	Stop Stop 	180 85 121 122			57 24 33 33			
Drinkwater Street Brady Street	087-065 (11C-1)	N Drinkw. E Brady S Drinkw. W Brady	967 34 661 536	16' 18' 16' 17'	 Stop Stop	286 17 181 161			106 4 58 52			
Drinkwater Street Larch Street	087-068 (11C-2)	N Drinkw. E Larch S Drinkw. W Larch	269 1231 1043 961	16' 16' 16' 18'		41 324 311 342			11 82 89 127			15 (63)
Drinkwater Street Cedar Street	087-069 (12C-1)	N YMCA E Cedar S Drinkw. W Cedar	84 593 301 656	DW 16' 17' 15'	Stop Stop 	13 150 105 176			2 57 35 57			
Notre Dame Avenue Kathleen Street E.	088-081 (5B-4)	N N.Dame E Dominion S N.Dame W Kathleen	2351 262 1841 962	18' 14' 17' 15.5'	67% 33% 67% 33%	570 79 629 291	1120 433 1230 332	0.51 0.18 0.51 0.88	134 25 188 85	335 130 370 99	0.40 0.19 0.51 0.86	17 (62) 23 (63) 15 (64)
Notre Dame Avenue King Street	088-085 (5B-5)	N N.Dame E King S N.Dame W King	2382 415 2423 380	18' 18' 18' 17	60% 30% 60% 30%	504 141 791 143	980 395 1060 387	0.52 0.36 0.79 0.37	129 36 231 33	294 118 318 113	0.44 0.31 0.73 0.29	31 (62) 21 (63) 24 (64)
Notre Dame Avenue Dell Street	088-087 (5B-5)	N N.Dame S N.Dame W Dell	2364 2389 247	17' 17' 17'	 Stop	571 777 56			156 187 18			
Nelson Street John Street	089-057 (4C-10)	N Nelson E John W John	1524 236 1430	15' 16' 16'	 Yield Stop	444 61 369			123 19 115			
Lourdes Street Nelson Street Morris Street Elgin Street	089-059 (2B-7)	N Lourdes E Morris S Nelson W Elgin	27 951 1973 2091	8' 15' 13' 18'	54% 36% 54% 36%	5 259 495 574	378 575 545 630	0.02 0.45 0.92 0.92	2 66 148 136	116 172 164 190	0.02 0.38 0.90 0.72	
Carleton Street Lloyd Street	089-071 (1A-15)	E Lloyd(S) E Lloyd(L) S Carleton W Lloyd	2972 1356 1662	12' 12' 19' 12'	48% 44% 44% 48%	424 320 433 542	571 436 650 825	0.74 0.73 0.67 0.66	189 143 180	302 195 247	0.63 0.73 0.73	31 (62) 11 (64)
Notre Dame Avenue La Salle Boulevard	092-110 (5B-7)	N N.Dame E LaSalle S N.Dame W LaSalle	982 1559 1954 39	24' 12' 26' 12'	39%	192 383 719 4	780 412 780	0.25 0.93 0.93	54 109 212 1	234 114 234	0.18 0.96 0.91	24 (62) 16 (64)
Notre Dame Avenue Turner Street	092-115 (5B-8)	N N.Dame S N.Dame W Turner	828 895 257	13' 13' 12'	 Stop	132 332 84			37 96 20			
Howey Drive Van Horne Street	093-062 (2B-9)	N Howey E Van H. S Howey W Van H.	796 57 567 360	15' 11' 15' 17'	 Stop Stop	197 9 171 169			49 3 51 46			
Bancroft Drive Kingsway	108-079 (1A-19)	E Kingsway S Bancroft W Kingsway	2423 394 2609	18' 12' 21'	 Stop 	631 84 842			174 15 242			
Attlee Street La Salle Boulevard La Fleur Street	121-110 (18C-3)	N La Fleur E La Salle S Attlee W La Salle	21 1870 246 1919	13' 12' 10' 12'	Stop Stop 	5 519 64 518			1 153 17 130			
Bancroft Drive Bellevue Avenue	123-068 (2B-13)	N Bancroft E Bancroft W Bellevue	364 684 610	10' 12' 12'	Stop Stop	109 158 199			26 42 65			
Shopping Centre La Salle Boulevard Lincoln Road	128-110 (18C-4)	N Lincoln E LaSalle S S.Centre W LaSalle	189 1339 689 1813	12' 12' 12' 12'	Stop Stop 	33 417 154 491			8 140 45 126			30 (62) 26 (63) 36 (64)
Garrydowne Avenue Kingsway	129-087 (1A-21)	N Barryd. E Kingsway W Kingsway	1067 1748 2353	24' 22' 24'	Stop 	294 450 708			77 131 205			18 (61) 11 (63) 14 (64)
Garrydowne Avenue Hawthorne Drive	130-101 (20C-1)	N Barryd. E Hawth. S Barryd. W Hawth.	1117 260 1001 260	10' 10' 10' 11'	 Stop Stop	331 60 261 45			89 17 67 13			

Volumes, Capacities and Accidents at Major Intersections (continued)

INTERSECTION	GRID NO. (SECTION)	APPROACH LEG FROM	PEAK PERIOD (2 HOUR) VOLUME	APPROACH WIDTH (FEET)	% GREEN TIME	PEAK HOUR APPROACH VOLUME V	PRACTICAL CAPACITY K	VOL/CAP RATIO(1) V/K	PEAK ½ HR. APPROACH VOLUME v	POSSIBLE ½ HR. CAP P	VOL/CAP RATIO(2) v/P	ACCIDENT EXPERIENCE 1962-64
Barrydowne Avenue /Shopping Centre Entrances 1, 2, 3	130-108 (20C-2)	N Barryd. S Barryd. W S.Centre	1150 1337 928	10' 10'	 Stop	238 371 252			86 105 77			
Barrydowne Avenue /La Salle Boulevard	130-110 (18C-4)	N Barryd. E LaSalle S Barryd. W LaSalle	329 1277 1152 1444	12' 11' 10' 12'	Stop Stop 	77 412 298 350			14 126 81 83			10 (61) 13 (64)
Falconbridge Road /Kingsway /Second Avenue	135-087 (1A-21)	N Falconb. E Kingsway S Second W Kingsway	1145 847 460 1754	20' 26' 10' 30'	Stop Stop 	348 176 105 557			105 45 33 149			 15 (62) 13 (63) 18 (64)
Second Avenue /Bancroft Drive	137-066 (2B-16)	N Second E Bancroft S Second W Bancroft	438 430 84 626	12' 16' 13' 9'	Stop Stop 	138 89 11 191			40 25 62			
Churchill Avenue /Falconbridge Road /Porter Street	139-092 (3B-1)	N Church NE Falconb. SW Falconb. W Porter	184 950 1110 18	10' 12' 12' 15'	Stop Stop	33 299 320 5			13 80 86 3			
Auger Avenue /La Salle Boulevard	141-110 (18C-5)	E LaSalle S Auger W LaSalle	1203 204 1189	12' 10' 12'	 Stop 	366 44 292			78 11 95			
Falconbridge Road /La Salle Boulevard	154-109 (3B-5)	N Falconb. E LaSalle S Falconb. W LaSalle	1097 178 793 780	12' 10' 12' 10'	52% 33% 52% 33%	396 75 187 183	520 238 520 230	0.77 0.31 0.42 0.77	125 22 42 50	156 71 156 71	0.80 0.31 0.72 0.70	
Falconbridge Road /Maley Drive	160-119 (3B-9)	N Falconb. E Maley S Falconb. W Maley	976 21 1012 101	12' 13' 12' 13'	 Stop Stop	204 6 339 49			46 2 108 19			
Levesque Street /Kingsway	163-069 (1A-25)	E Kingsway S Levesque W Kingsway	712 123 789	12' 12' 12'	 Stop 	158 25 271			59 8 64			

ESTIMATION OF DAILY ROADWAY CAPACITY

	INTERMEDIATE AREA				DOWNTOWN AREA			
	Expressway	High-Type Arterial	Standard Arterial	One-way Street	Expressway	High Type Arterial	Standard Arterial	One-way Street
Basic lane width	12'	11'	11'	11'	12'	11'	11'	11'
Parking	-	Not permitted		-	-	Not permitted		-
Turns	R.hand only	20%	20%	20%	R.hand only	20%	20%	20%
Commercial Vehicles	10%	10%	10%	10%	10%	10%	10%	10%
Signals	none	fixed time	fixed time	fixed time	none	fixed time	fixed time	fixed time
Capacity per lane per hour greentime	1700	1100	950	1040	1700	1000	700	900
Peak hour ratio of 24 hr. vol.	10.5%	10.5%	10.5%	12.5%	10.5%	10.5%	10.5%	12.5%
Peak hour split	60-40	60-40	60-40	N/A	60-40	60-40	60-40	N/A
Green time	N/A	50%	50%	50%	N/A	50%	50%	50%
24 hour Capacity								
2 lanes	-	-	7,550	8,320	-	-	5,550	7,200
4 lanes	54,000	17,500	15,100	16,640	54,000	15,900	11,100	14,400
6 lanes	81,000	26,000	22,650	-	81,000	23,800	16,700	-
8 lanes	-	35,000	-	-	-	31,800	-	-

SUDBURY AREA
TRANSPORTATION STUDY

DILLON

EXHIBIT A
sheet 4 of

SPEED and DELAY SURVEY – MAJOR ROUTE CHARACTERISTICS

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
ROUTE 1T BRADY STREET					
RADY STREET From: Douglas St. W. To: Minto St.	1T-11/14	2,750 feet	25-30 m.p.h.	Sight restrictions reduce visibility for northbound to eastbound R.H. merge from Perrault to Brady Alignment at C.P.R. underpass does not allow eastbound drivers to see ahead to the signalized intersection at Brady/Minto. Thus, they have no advance warning of back-ups or delays in traffic ahead Very sharp eastbound to southbound R.H. turn from Brady to Grey. Buses using this route have difficulty negotiating the turn and impede following traffic Inadequate warning of lane designations on the eastbound approach to the Brady/Minto intersection	Brady narrows from 4 lanes to 2 lanes at Douglas W. Pavement markings and lane designations not clear for westbound to southbound L.H. turns from Brady to Perrault Very narrow sidewalks near Grey seem to warrant barriers or guard rails for the protection of pedestrians snd to prevent random crossing of Brady
RADY STREET From: Minto St. To: Drinkwater St.		700 feet	11-15 m.p.h.	Brady Street narrows from 4 lanes to 2 lanes at Minto Street	
ROUTE 1A HIGHWAY NO. 17, LORNE STREET SOUTH, ELM STREET WEST, ELM STREET EAST, LLOYD STREET, KINGSWAY					
IGHWAY NO. 17, ORNE STREET From: W. City Limit Martindale Rd.	1A-1/3	5,800 feet	24-38 m.p.h.	Wide 4-lane route with good visibility, buildings well set back Signals at Lorne/Martindale are coordinated with Martindale/Ontario on south side of C.P.R. tracks with railway pre-emption of the right-of-way at the grade crossing Lorne/Martindale intersection has no channelization	
ORNE STREET From: Martindale Rd. To: Elm St. W.	1A-4/10	7,600 feet	7-25 m.p.h.	4-lane roadway has minimum setbacks at some sections Short bus bays on S. side near Byng Street The roadway is marked for 3 lanes east-bound and 1 lane westbound east of Lorne/Regent intersection R.H. lane is channelized for compulsory R.H. turn but without adequate advance warning of this requirement. 2 lanes continue eastbound through signals intersection of Lorne Street and Regent Street South and northbound to eastbound traffic from Regent St. merges on the right. All northbound traffic from Regent Street is obliged to turn right at Lorne Street by the channelization. Vehicles in the L.H. lane may turn northbound at Lorne-Haig-Regent during off-peak periods. An overhead blank-out sign prohibits the L.H. turn during peak periods. Very short weaving distance between R.H. merge at Lorne/Regent and L.H. turn at Lorne/Haig/Regent. L.H. turns are made more dangerous by the acute angle of intersection The whole traffic complex involving the Regent Street grade crossing of the C.P.R. and the intersections: Regent/Riverside/Ontario, Lorne/Regent and Lorne/Haig/Regent is the most difficult in the City. It is undoubtedly most confusing and dangerous for out-of-town drivers using routes designated as the Trans-Canada Highway Lorne/Hazel/Alder, Lorne/Victoria and Lorne/Birch intersections are hazardous due to the angles of the approaches (i.e. Lorne Street is diagonal - with respect to the area roadway grid). Sharp curve in Lorne Street near Spruce Street has no curve widening and poor visibility Lorne/Elm intersection is subject to severe congestion. Multi phase signal is set to favour traffic on the Highway No. 17 route, i.e. northbound to eastbound R.H. turns and westbound to southbound L.H. turns. Various other turning movements at this location are prohibited	Multi phase signal at Lorne/Regent permits almost continuous flow of straight westbound traffic in a single lane. Westbound to southbound L.H. turns are somewhat delayed because of the complexities of traffic movements to be accommodated at the Lorne/Regent intersection working in conjunction with Regent/Riverside/Ontario intersection. Train movements preempt the grade crossing, and these two intersections then function independently Southbound traffic on Regent Street meets Lorne Street at a very poor acute angle Considerable lane changing by westbound and southbound traffic leaving the Lorne/Douglas intersection because lanes are designated as one westbound and one southbound at Lorne/Regent intersection, although there is little advance warning of this condition
M STREET WEST, M STREET EAST, OYD STREET From: Lorne St. To: Kingsway	1A-11/16	4,750 feet	8-24 m.p.h.	C.P.R. grade crossing causes delay, and backing up interferes with adjacent intersections, particularly Elm/Frood Short block lengths and heavy left turns from Elm onto Elgin, Durham and Lisgar Streets delay straight through traffic Elm between Young and Carleton Streets has very poor vertical alignment and poor horizontal alignment with 4-lane pavement narrowing and jog at the crest of the hill. Concealed intersections at Pearl Street, Fairview and Cooper Avenues contribute further to the hazardoua situation Signed Truok Route via Carleton Street, which svoids the difficult Elm Street hill, appears to be generally ignored by truck drivers. Poor approach by eastbound traffic to Lloyd/Carleton intersection Sharp curve and narrow pavement where Lloyd Street joins the Kingsway, restrict traffic to 2 lanes only	Steep down grade for westbound traffic approaching Young/Elm intersection Special phase for westbound to southbound L.H. turns at Lloyd/Carleton intersection made possible by prohibition of north-bound/westbound L.H. turns
NGSWAY From: Lloyd St. To: E. City Limits	1A-17/27	28,100 feet	26-57 m.p.h.	Poor pavement definition, confusion of drivways and skewed intersecting streets interfere with traffic movement Poor pavement surface Route widening was carried out east of the old city limits subsequent to the 1963 studies reported here Numerous driveways to fronting uses interfere with traffic Well designed and channelized intersections at Barrydowne Road and Falconbridge Highway 2-lane rural cross section east of Falconbridge Highway with 60 m.p.h. speed limit Northbound traffic from Moonlight Avenue onto Kingsway approaches on difficult up-grade	Grade and rock faces restrict visibility of westbound drivers approaching Kingsway/Falconbridge intersection

Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
ROUTE 2A HIGHWAY 69, REGENT STREET SOUTH					
HIGHWAY 69, REGENT STREET SOUTH From: S. City Limit To: Paris St.	2A-1	3,950 feet	27-35 m.p.h.	Rural 2 lane cross section with good alignment and visibility except on northbound approach to Regent/Paris intersection, due to narrow rock cut, curve and grade Angles and grades at Loach's Road/Regent/Algonquin intersection give rise to some hazards. Situation is particularly difficult for school children and other pedestrians. No sidewalks 3 R.H. turn movements at Regent/Paris intersection are channelized but the absence of pavement widening on intersection approaches causes some delay	
REGENT STREET SOUTH From: Paris St. To: York St.	2A-2/4	9,850 feet	27-35 m.p.h.	2-lane cross section, 35 m.p.h. speed limit Mixed residential and commercial fronting uses with some poorly designed and located driveways Some confusion south of Bouchard caused by original roadway immediately west of new rock-cut section. Widening, curbs etc. required Alignment at Martindale/Regent/Walford and visibility restrictions lead to some confusion for straight northbound traffic 45 m.p.h. speed limit posted north of Martindale Rd. Visibility somewhat restricted in rock-cut at Sudbury Memorial Hospital Pedestrians observed using roadway shoulders. No sidewalks; no roadway illumination	Poor angle of intersection between Martindale and Regent. Poor visibility for southbound drivers approaching intersection
RECENT STREET SOUTH From: York St. To: Lorne St.	2A-5/6	2,900 feet	5-22 m.p.h.	Street has Urban character with 4 lanes and posted 30 m.p.h. speed limit Moderate to heavy northbound to westbound L.H. movement from Regent to McLeod following signed route, impedes straight northbound traffic Regent/Riverside/Ontario intersection forms part of complex discussed under Route 1A Some northbound to eastbound R.H. turns from Regent to Riverside take a short cut through Dominion Store parking lot	
ROUTE 3A ONTARIO STREET, McLEOD STREET					
ONTARIO STREET, McLEOD STREET From: Martindale Rd. To: Regent St.	3A-1/2	2,950 feet	8-22 m.p.h.	See comments for Lorne/Martindale intersection under Route 1A. Closeness of Lorne/Martindale and Ontario/Martindale intersections causes congestion because of the need to coordinate signals Some delay at Regent/McLeod/Hyland signalized intersection	Channelization provided for westbound to northbound R.H. turns from Ontario to Martindale Some backing up of westbound traffic, particularly when railway crossing is occupied Westbound traffic on McLeod Street controlled by a stop sign at Ontario St. Visibility restricted due to skewed intersection
ROUTE 1B HIGHWAY NO. 544, LEVACK ROAD, SPRUCE STREET, REGENT STREET SOUTH, ELM STREET WEST AND LORNE STREET NORTH					
HIGHWAY NO. 544 LEVACK ROAD From: W. City Limits To: Travers St.	1B-1/6	22,500 feet	25-48 m.p.h.	2-lane, rural cross section, realigned and repaved in 1963 Problems of horizontal alignment and sight distance remain in spite of improvement works Bad horizontal and vertical alignment west of Clarabelle Road result in hazardous eastbound and northbound approaches at the Clarabelle Rd./Highway 544 intersection Very poor approaches and visibility at C.P.R. underpass Tight reverse curve between rock faces just west of Travers Street conceals entry to the built-up area Greater emphasis of advisory and regulatory speed signs approaching urban development may be warranted	Westbound to southbound L.H. turn hazardous because vertical alignment conceals oncoming vehicles
SPRUCE STREET From: Travers St. To: Regent St. S.	1B-7/11	2,150 feet	10-17 m.p.h.	Adequate visibility, good pavement surface, gentle grades to Eyre St Jog in route at Eyre Street T intersection at Regent Street South Eastbound traffic on Spruce approaches Regent with bad downgrade to a stop sign, where drivers proceeding to City Centre are required to make L.H. turn. Considerable delays are experienced here, largely due to embankment and building on S.W. corner, which restrict visibility	
REGENT STREET SOUTH, ELM STREET WEST From: Spruce St. To: Lorne St.	1B-12/13	2,150 feet	10-17 m.p.h.	Delays experienced at Regent/Elm Signals Delays experienced at Elm/Lorne Signals (refer also to comments under Route 1A)	Drivers proceeding on Hwy. 544 from the City Centre make a L.H. turn at Regent Elm Signals or continue on Elm Street and use Local Street connections to Spruce Street.
LORNE STREET NORTH From: Elm Street To: Frood Road	1B-14	800 feet	8-10 m.p.h.	Northbound roadway approaching C.P.R. underpass has steep grade and bad curve making it particularly difficult for trucks and buses Drivers attempt to use 2 lanes approaching Frood Road Signal although the roadway is very narrow for this Northbound vehicles emerging from C.P.R. underpass are obscured by central piers from the approaching southbound traffic on College Street. Considerable caution thus required for southbound to eastbound L.H. turns Northbound to eastbound R.H. turns from Lorne Street to Frood Road have some difficulty negotiating the tight corner radius	

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Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
ROUTE 2B ELGIN STREET NORTH AND SOUTH, MORRIS STREET, HOWEY DRIVE, BELLEVUE AVENUE, BANCROFT DRIVE, CONISTON ROAD					
ELGIN STREET NORTH, ELGIN STREET SOUTH From: Beech Street To: Durham Street	2B-1/2	1,800 feet	5-25 m.p.h.	Street operates one-way southbound	Signal progressions from Beech to Elm operate quite well but pedestrian phases restrict available green time. Cedar Street and Larch Street traffic controlled by stop signs L.H. turns from Cedar and Larch Streets onto Elgin Street are subject of some hazard, due to turning angle and curve in Elgin Street Left turns from Elgin often made from centre lanes suggesting that overhead lane designation might help to remind drivers that they are on a one-way street, and should follow the L.H. curb prior to turning Turnoff at Local Lines Ltd. bus terminal is very narrow for the size of the vehicles using it more substantial channelization appears warranted for guidance of southbound/eastbound and westbound/northbound traffic at Durham/Elgin intersection Westbound to northbound traffic from Elgin Street to Durham Street receives minimal warning of required R.H. curve or of oncoming on-way southbound traffic on Elgin Street.
ELGIN STREET SOUTH From: Durham St. To: Nelson St.	2B-3/6	2,600 feet	15-27	Multi phase signal at Elgin intersection. Minto St. functions quite well Pavement narrows east of Minto St. to effectively restrict traffic to one lane eastbound Parking on the boulevard causes some interference with traffic movement Drinkwater Street operates one-way northbound Elgin, Nelson, Morris Llourdes intersection operating with stop signs on all 4 approaches at time of survey Angles of approaching streets and approach grades contribute to poor definition of the Elgin/Nelson intersection. Only single lane approaches available	Poor visibility for southbound traffic on Shaughessy St., approaching Elgin, due to skewed approach, and to curve and gradient on Elgin St. Gradient through Elgin/Drinkwater intersection and corner radius impedes westbound to northbound R.H. turns Curb parking interferes with traffic movement
MORRIS STREET, HOWEY DRIVE From: Nelson Street To: Bellevue Ave.	2B-7/12	8,400 feet	21-29 m.p.h.	Good width, alignment, visibility and grades as far as Wessex St. Poor pavement surface and visibility restrictions due to curves through rock outcrops, evident from Wessex St. to Bellevue Ave. Narrow shoulders and lack of sidewalks create hazard for many schoolchildren observed on this route Sharp L.H. turn required by eastbound vehicles at Bellevue Ave. Virtually no warning given of this abrupt change in route alignment	
BELLEVUE AVENUE From: Howey Drive To: Bancroft Dr.	2B-13	2,300 feet	20-24 m.p.h.	Irregular horizontal alignment, particularly near shore of Minnow Lake No sidewalks for schoolchildren Badly placed bus stop combines with poor horizontal and vertical alignment, and poor roadway definition to create a dangerous eastbound approach to the stop sign at Bancroft Drive	
BANCROFT DRIVE From: Bellevue Ave. To: E. City Limits	2B-14/21	21,500 feet	25-33 m.p.h.	Sharp reverse curves, restricted visibility Frequent intersections with local streets are made dangerous by inadequate visibility Roadway allowances and building setbacks appear adequate to allow road widening Poor pavement condition between First and Fourth Avenues Irregular horizontal and vertical alignments create restricted visibility along this entire section	
ROUTE 3B FALCONBRIDGE HIGHWAY, HIGHWAY NO. 541					
FALCONBRIDGE HIGHWAY From: Kingsway To: Hudson Street	3B-1/4	6,800 feet	37-41 m.p.h.	Poor angle of intersection creates some difficulty for northbound vehicles making L.H. turn onto Churchill Ave. Rough pavement, uneven cross slopes, narrow badly formed shoulders	Steep upgrade on approach to Kingsway, but intersection design allows for adequate visibility Southbound traffic on Churchill meets Falconbridge Highway on upgrade, and at poor angle of intersection Southbound traffic on Falconbridge not plainly visible to vehicles southbound on Churchill

Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
FALCONBRIDGE HIGHWAY From: Hudson Street To: Maley Drive (City Limits)	3B-4/7/8	7,200 feet	24-34 m.p.h.	Intersection at La Salle Boulevard controlled with stop signs on all 4 approaches at time of the Survey No pavement widening provided on approaches to Falconbridge/La Salle intersection. Pavement edge deliniation poor Badly skewed intersection at Carmello Ave. with upgrade on the latter leads to poor visibility for merging northbound vehicles on both roadways Two C.N.R. at-grade crossings have crossing signals. Visibility at crossings adequate.	
				ROUTE 4B DURHAM STREET	
DURHAM STREET From: Elgin St. To: Beech St.	4B-1	1,700 feet	11-17 m.p.h.	Durham/Elgin intersection referred to under Route 2.B One way northbound operation, major shopping street of City Although signal progression is in operation, close spacing of signals results in some delays Pedestrian phase reduces vehicle green signal time, although heavy pedestrian volumes do appear to warrant special consideration Poor corner radius at exit from Local Lines Ltd. bus terminal forces buses to swing wide and interfere with 2 lanes of traffic Designation of lanes for turning movements, preferably with overhead signs, might improve flow characteristics jogged connection with Hospital Crescent at the north end of Durham Street causes some delay	
				ROUTE 5B BEECH STREET, NOTRE DAME AVENUE, HIGHWAY 69 NORTH	
BEECH STREET From: Frood Rd. To: Lisgar St.	5B-1	1,200 feet	6-15 m.p.h.	Short blocks between signalized intersections give rise to low speed in spite of apparently good signal progression Eastbound to northbound L.H. turns at Hospital Crescent conflict with straight through traffic on Beech Street, and with movements from Durham Street onto Hospital Crescent At Beech/Lisgar/Notre Dame intersection, multi-phased signal, irregular angles of approach, and narrow approach widths combine to create back-ups in all directions during peak periods	Skewed intersection at Frood/Be makes visibility poor for westb drivers wishing to turn north o south from the stop sign Westbound to southbound L.H. tu at Elgin/Beech delay traffic Very short green phase exclusiv for westbound to southbound L.H. turns, at Lisgar/Beech/Notre Da intersection
NOTRE DAME AVENUE From: Beech/Lisgar To: Wilma St.	5B-2/5	5,800 feet	11-30 m.p.h.	Most sections too narrow to properly accommodate 4 lanes of moving traffic Inadequate entrances and exits to parking facilities along C.N.R. right-of-way cause conflicts and hazards Considerable numbers of schoolchildren using the route because of its proximity to several schools Poor visibility for drivers leaving Jogues, Verecheres and Xavier Streets and turning onto Notre Dame, due to curve in latter route Number of Signal Leads and their placement appeared to be substandard at Kathleen and King Streets, at time of survey Poor definition of pavement and poorly designed driveway entrances give rise to difficulty for in and out movements associated with food markets and other retail outlets	
NOTRE DAME AVENUE From: Wilma Ave. To: La Salle Blvd.	5B-6/7	5,400 feet	35-38 m.p.h.	Excellent 4-lane divided roadway Sparse roadside development (a considerable degree of access control might be feasible here if suitable restrictions are imposed BEFORE further development of fronting properties occurs) Minor signal delays at La Salle Blvd. inter-section Northbound to eastbound R.H. turns channelized	Disconcerting transition for sc bound drivers passing Wilma ent narrower section of roadway and becoming subject to interferenc
NOTRE DAME AVENUE HIGHWAY 69 From: La Salle Blvd. To: N. City Limits	5B-8/9	5,600 feet	24-38 m.p.h.	Abrupt narrowing of roadway to 2 lanes L.H. turn lane provided at Turner Street Typical 2-lane, rural highway cross section has posted speed limit of 50 m.p.h.	
				ROUTE 6B FROOD ROAD, TURNER STREET	
FROOD ROAD From: Elm St. W. To: Kathleen St.	6B-1/2	3,800 feet	10-25 m.p.h.	Northbound traffic can approach the Lorne/College intersection in three lanes R.H. turns Froom-College are concealed from northbound Lorne-College traffic by underpass structure. Hence, R.H. turns on a red signal should be cautioned or prohibited Fir Street traffic complicates intersection manoeuvres. L.H. turns Fir-Frood are particularly hazardous, as are the crossing movements required for the Fir-Frood-Lorne routing Considerable numbers of students and other pedestrians in this vicinity indicate the need for more protective measures, including channel-ization "refuge" islands at the Lorne-College-Frood intersection. Such channelization would also aid in reducing inordinately broad expanses of pavement area, particularly in the north-east quadrant	Southbound to eastbound L.H. t prohibited at Elm Street West. Hence, southbound to eastbound turns at Beech Street become m movement into downtown Movement into Loblaw's parking delays southbound traffic beca pavement is not wide enough fo 4 lanes of traffic Southbound L.H. turns College- offered poor visibility of onc traffic through the Lorne Stre underpass. Also, pavement on College St. approach not suffi wide to accommodate two lanes traffic, thus leadin to delay southbound College-Lorne movem L.H. turn radius called for is wide, because of broad south-e (Frood Rd.)approach to interse Lane designations not well def All L.H. turns at Lorne Frood section are difficult

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Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
				Poor horizontal alignment, several instances of restricted visibility, difficult traffic conflicts and skewed angles of intersecting streets all indicate further need for detailed roadway design in vicinity of Frood/Bloor and Frood/Regent/Kathleen intersections (revisisions to permitted traffic movements afforded some relief during the course of the 1963 surveys) Extremely bad C.P.R. railway at-grade crossing between Regent Street and Frood Rd. offers virtually no visibility over the hump. Very poor pavement deliniation, and sharply curved, steeply graded crossing approaches add the possibility of head-on collision to the more usual hazards arising from poor horizontal and vertical alignment and poor visibility	
FROOD ROAD From: Kathleen St. To: Turner St.	6B-3/6	11,400 feet	25-28 m.p.h.	Residential development, particularly new homes in Northern Heights on east side of Frood Road, generates much pedestrian and baby carriage traffic, etc. for which existing sidewalk provision is quite inadequate Poor intersection approaches at Burton Avenue especially hazardous, due to fast-moving north- and southbound traffic to and from Frood Mine. Visibility restricted due to steem embankments along east side of Frood Rd.	
TURNER STREET From: Frood Rd. To: Notre Dame Ave. (Highway 69)	6B-7	4,800	-	Not included in Speed and Delay Survey	
ROUTE 11B CLARABELLE ROAD (INCO PRIVATE ROAD)					
CLARABELLE ROAD From: Highway 544 To: Town of Copper Cliff	11B-1	8,200 feet	18-31 m.p.h.	No barriers, gates or other restrictions are evident, and the public makes considerable use of this route notwithstanding the private ownership Frequent visibility restrictions due to rock outcrops and deficiencies in alignment, particularly horizontal alignment, at North Mine and C.P.R. at-grade crossing. Poor approach to Highway 544 due to poor alignment of that route (see discussion under Route 1.B)	
ROUTE 1C REGENT STREET SOUTH, REGENT STREET NORTH					
REGENT STREET SOUTH From: Lorne St. S. To: Elm St. W.	1C-1/3	3,800 feet	12-27 m.p.h.	See discussion of Lorne/Haig/Regent intersection under Route 1A Eastbound to northbound L.H. turns from Lorne to Regent re-route via Douglas Street during peak periods, when the overhead sign prohibits them at the Lorne/Haig/Regent intersection. Some variations in vertical alignments. Narrow roadway widths inhibits traffic flow, particularly where curb parking occurs in front of retail and business premises Restricted visibility at Regent/Spruce intersection described under Route 1B	
REGENT STREET NORTH From: Elm St. W. To: Frood Rd./Kathleen St.	1C-4/5	2,600 feet	13-26 m.p.h.	Poor visibility at driveway of T.V. station due to the crest of the hill Straight alignment with adequate roadway width, but very poor vertical alignment combined with very steep grades Very poor visibility at Regent/Beatty/McKim intersection and very bad approaches and visibility at C.P.R. at-grade crossing Complex channelization at Regent/Frood/Kathleen intersection made more hazardous by bad approach, for eastbound vehicles crossing the tracks. A minimum of advisory and warning signs is provided. Some turning movements are displaced from main intersection; no traffic signals are provided and visibility restrictions affect northbound and southbound traffic on Frood Road. See also comments under Route 6B	Very steep hill causes major slowdown of heavy vehicles, and leads to restricted visibility over crest
2C MARTINDALE ROAD					
MARTINDALE ROAD From: Regent St. S. To: Charlotte St.	2C-1/3	4,000 feet	20-26 m.p.h.	Rural type of roadway development without sidewalks, curbs or gutters Poor horizontal and vertical alignment cause visibility restrictions which make this road unsafe for the considerable numbers of schoolchildren who use it Approaches to Martindale/Southview are quite narrow. The short length of Lily Creek culvert contributes to hazard, in that drivers emerging from Southview Dr. could overshoot culvert, and plunge into creek	Very poor approach for southbound traffic from Martindale to Regent/Walford intersection. See also comments for Route 2A Substantial grade differential between Martindale and Regent just north of intersection Steep downgrade approaching Martindale/Southview intersection: visibility restricted
MARTINDALE ROAD From: Charlotte St. To: Lorne St.	2C-4	1,950 feet	21-26 m.p.h.	Sharp turn at Copper leads to visibility restriction. Pavement ends Narrow bridge at Junction Creek, good wide pavement north of bridge See also comments under Routes 1A and 3A	Visibility afforded motorists southbound-eastbound at Copper impaired by sharp curve and minimum building setbacks
ROUTE 3C KELLEY LAKE ROAD, SOUTHVIEW DRIVE AND BOUCHARD STREET					
KELLEY LAKE ROAD From: Lorne St. To: Southview Dr.	3C-1/3	5,300 feet	20-26 m.p.h.	Rough gravel surface without curbs, gutters, sidewalks or illumination Sharp turn approaching C.P.R. crossing with poor visibility: no warning signals Many large trucks using this road for access to heavy industries, contribute to surface deterioration Narrow culvert at Junction Creek Generally poor horizontal and vertical alignments: at least one "blind" hill on this section	

Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
SOUTHVIEW DRIVE From: Kelley Lake Rd. To: Bouchard St.	3C-4	3,400 feet	28-30 m.p.h.	Roadway has adequate horizontal and vertical alignments, through area of residential subdivision	
BOUCHARD STREET From: Southview Dr. To: Regent St. S.	3C-5	1,150 feet	14-22 m.p.h.	Eastbound traffic at Southview/Bouchard is controlled by a yield sign. Motorists executing eastbound to northbound L.H. turns following southview afforded poor visibility of oncoming through vehicles from Bouchard due to vertical alignment: Bouchard falls away in steep down-grade, immediately east of intersection Very poor intersection at Bouchard/Regent. Hazardous situation caused by continued use of former Regent Street alignement, and by remaining rock outcrop between old and new alignments. Curvature of Regent South and lack of clear pavement edge definition in vicinity of confusing double "roadway allowance also contribute to visibility problems. Refer also to comments under Route 2A	Westbound movement from Bouchard to Southview designated as the through movement because of steep up grade on the approach at Bouchard/Southview. Southbound traffic from Southview controlled by stop sign
ROUTE 4C PARIS STREET, JOHN STREET, NELSON STREET					
PARIS STREET From: Regent St. To: Facer St.	4C-1/8	12,600 feet	18-32 m.p.h.	Paris/Regent intersection is partially channelized but lacks any pavement widening on approaches, or at driveways serving "Plaza 69" Refer also to comments under Route 2A Sidewalks would seem desirable around apartment buildings and shopping plaza Poor pavement surface, poor horizontal and vertical alignment, visibility restrictions, lack of sidewalks or lighting, are all incompatible with the moderately heavy use made of this arterial route, which is a connection between Plaza 69 and downtown Sudbury. Nearby schools, developing residential uses and future requirements of Laurentian University would all indicate the need for improvement of this route based upon its present classification and function Recent improvements at Paris/York provides adequate approach pavement width, but painted channelizing islands are poorly placed, and have inadequate length Roadway very narrow in front of Sudbury General Hospital where movements into and out of parking lot, bus loading and unloading and vehicles parked on the roadway combine to cause a very hazardous situation, especially during evening hospital visitint hours, and staff shift changes. Visibility restricted because of curve in Paris to the south, and because of high embankment along west side of Paris Considerable jog in the roadway at Facer indicates the necessity of some property acquisition for the proper realignment of Paris	
PARIS STREET From: Facer St. To: John St.	4C-9	1,050 feet	16-25 m.p.h.	Curve widening and channelization provided for major northbound-eastbound and westbound-southbound movements at Paris/John	Some difficulties experienced by southbound and westbound traffic emerging from Paris and John, proceeding from stop signs onto main roadway, because of visibility restrictions
JOHN STREET From: Paris St. To: Nelson St.	4C-10	550 feet	14-16 m.p.h.	Physical layout and operational efficiency of John/Nelson intersection considerably restricted by building on N.W. corner. Main movements are eastbound-northbound and southbound-westbound, but major eastbound traffic flow is controlled by a stop sign which causes some delay	Minor westbound movement on John is controlled by a yield sign
NELSON STREET From: John St. To: Elgin St. S./ Morris St.	4C-11	700 feet	14-16 m.p.h.	Old narrow bridge over C.P.R. accommodates 2 lanes of traffic only Major movements at Elgin/Nelson/Morris intersection are northbound - westbound and eastbound - southbound. All approaches were controlled by stop signs at time of survey, and some delays were experienced. Intersection is now signalized. Refer also to comments under Route 2B	
ROUTE 5C RAMSEY LAKE ROAD					
RAMSEY LAKE ROAD From: Paris St. To: Easterly End	5C-1/2	12,600 feet	15-29 m.p.h.	Very rough surface, steep grades, sharp curves, poor visibility, lack of shoulders, curbs, sidewalks or illumination. Safe driving speed about 25 m.p.h. Major access to Laurentian University Campus presently under development Kirkwood Drive intersection, Sanitorium entrance and driveways all concealed by hedges and trees alongside roadway	
ROUTE 6C YORK STREET					
YORK STREET From: Regent St. S. To: Paris St.	6C-1/2	3,400 feet	22-24 m.p.h.	Wide recently built roadway contains some sections of poor horizontal and vertical alignment Improvements in alignment and sight distances would appear to offer far greater prospective safety to schoolchildren and other pedestrians, than the existing 25 m.p.h. speed limit which appears to be intended as a safety measure Deficiencies in painted channelization at Paris are discussed under Route 4C	North curb line jogs abruptly at Lancaster Street, at the crest of a grade affording poor visibility
ROUTE 7C ONTARIO STREET					
ONTARIO STREET From: McLeod St. To: Regent St. S.	7C-1	2,350 feet	19-20 m.p.h.	Refer also to Route 3A Wide, new, well-aligned street alongside C.P.R. carries only light traffic movements Little delay at Regent/Riverside/Ontario although the complexity of this 5-way intersection requires a multi-phase signal See also comments under Routes 1A and 2A	Poor intersection at McLeod with skewed approach: major westbound traffic movement controlled with a stop sign

Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
			ROUTE 8C RIVERSIDE DRIVE		
SIDE DRIVE m: Regent St. S. Worthington Cres.	8C-1/2	3,930 feet	17-20 m.p.h.	Refer to Routes 1A, 2A, 7C etc. for comments on Regent/Ontario Riverside intersection Considerable turning movements at Dominion Store which has one parking lot entrance very close to the intersection. Left turns leaving the parking lot cause some difficulties Cross acts as a short-cut from Regent to Douglas/Brady Poor intersection at Douglas/Riverside due to approach angles, bend in Riverside and obstructed visibility across N.W. corner of intersection Traffic in both directions controlled by stop signs at Perreault to allow traffic from Brady Street to clear. Eastbound to northbound L.H. turns from Riverside to Perrault are delayed at stop sign, as single eastbound lane is blocked by vehicles waiting to make L.H. turn Very sharp corner from Riverside to Worthington causes obstructed visibility; particularly difficult for motorists travelling eastbound to southbound movements, Conditions worsened when buses or large trucks negotiate turn	Poor visibility for traffic turning from Perreault onto Riverside due to obstructed visibility across both corners of intersection
			ROUTE 9C DOUGLAS STREET WEST		
AS STREET WEST m: Regent St. S. Brady St.	9C-1	1,630 feet	4-23 m.p.h.	Douglas controlled with stop signs at Regent Jog in Douglas alignment, and limited visibility, especially across S.E. corner of intersection. See also Route 1C Congestion occurs at Douglas/Lorne intersection because of traffic to and from Brady Street crossing the C.P.R. line, and because of turning movements displaced from Lorne/Haig/Regent intersection. Multi-phase signal subject to pre-emption by trains using at-grade C.P.R. crossing. See also Route 1A Douglas is the major connection with the south end of Brady Street but has inferior width and alignment for its current traffic function. See also comments under Route 1T	Southbound to eastbound L.H. turns are heavy at Douglas/Regent
AS STREET WEST m: Brady St. Riverside Dr.	9C-2	650 feet	14-16 m.p.h.	Eastbound traffic at Douglas/Riverside controlled by stop sign. Poor visibility due to approach angle etc. Refer also to comments under Route 8C	Westbound traffic on Douglas controlled by stop sign at Douglas/Bradey, to permit free flow of eastbound to northbound and southbound to westbound movements between Douglas and Brady
			ROUTE 10C MINTO STREET		
STREET m: Elgin St. S. Larch St.	10C-1	1,260 feet	13-20 m.p.h.	Multi-phase signal at Elgin/Minto/Van Horne includes pedestrian phase. Van Horne is one-way eastbound leaving the intersection. Frequent delays occur here perhaps due to unnecessarily long signal cycle. No right turns on red signal allowed For comments concerning Minto/Brady intersection, see Route 1T Minto/Larch is a "T" intersection, with all 3 approaches controlled by stop signs. This intersection appeared to function remarkably well under the traffic loads experienced during survey	
			ROUTE 11C DRINKWATER STREET		
WATER STREET m: Elgin St. S. Van Horne St.	11C-1	660 feet	16-17 m.p.h.	One way northbound (southbound traffic, if permitted, would face very difficult up-grade, and poor angle of intersection at Elgin.	"NO ENTRY" sign facing southbound traffic at Drinkwater/Van Horne barely adequate in size or effectiveness, and occasional "wrong-way vehicles" were observed. Some channelization appears warranted Southbound traffic re-routed via Van Horne and Shaughnessy. Poor angle of intersection and poor visibility at Shaughnessy/Elgin intersection. See also Route 2B
WATER STREET m: Van Horne St. Cedar St.	11C-2	1,620 feet	13-20 m.p.h.	Drinkwater traffic controlled by stop signs at Larch and Cedar, at time of survey. (Drinkwater/Larch was subsequently signalized) Considerable delays experienced at stop signs additional delays due to L.H. turns, as Drinkwater not wide enough to accommodate 2 northbound (or 2 southbound) lanes	
			ROUTE 12C CEDAR STREET		
STREET m: Elgin St. S. Carleton St.	12C-1	2,600 feet	5-21 m.p.h.	Cedar between Elgin and Durham is used as a terminal area by Sudbury Bus Lines Limited. There is some impedance to other traffic caused by the manoeuvering of buses Durham/Cedar intersection is signalized and includes "amble-scramble" pedestrian phase Curb parking and access to and from parking lots lead to delays between Durham and Lisgar Four-way stop and red flasher controls at Cedar/Lisgar and Cedar/Young Stop sign for eastbound traffic at Cedar/Carleton intersection affords somewhat restricted visibility Cedar Street is a major downtown circulation route and appears to function well, but diversity of intersection controls can be confusing for drivers unfamiliar with the street	Westbound to southbound L.H. turns Cedar to Elgin afforded restricted visibility and poorly defined turning lanes. See also comments under Route 2B

Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
				ROUTE 13C LISGAR STREET	
LISGAR STREET From: Larch St. To: Beech St./ Notre Dame Ave.	13C-1	1,150 feet	2-10 m.p.h.	"T"-intersection at Lisgar/Larch controlled on all 3 approaches by stop signs Lisgar/Cedar intersection controlled by stop signs on all 4 approaches Parking at meters in short block between Larch and Cedar tends to interfere with moving traffic and intersection operation Considerable pedestrian volumes and turning vehicles cause delay at Lisgar/Elm intersection. See also Route 1A Lisgar bends sharply between Elm and Borgia with roadway narrowing from 4 to 2 lanes. The operation of the Taxi stand on this elbow interferes with traffic movement Poor definition of "double" intersection at Lisgar/ Borgia and Lisgar/Beech/Notre Dame causes confusion and a generally most unsatisfactory situation. Multi-phase signal at Lisgar/Beech/Notre Dame causes some of the worst delays experienced in the survey Visibility of vehicles leaving Borgia is restricted by bend in Lisgar. Large trucks and buses in this area aggravate the situation. Whole complex requires overhaul. See also comments under Route 5B	Heavy usage of short-term meters outside post office, and some double parking interferes with southbound traffic and intersection operation
				ROUTE 14C KATHLEEN STREET	
KATHLEEN STREET From: Frood Rd. To: Notre Dame Ave.	14C-1/4	5,170 feet	16-26 m.p.h.	Refer to comments under routes 1C and 6B regarding the Regent/Kathleen/Frood intersection Commercial and shopping frontages between Frood and Burton, and curb parking accommodation interfere with moving traffic Many "T" intersections along Kathleen. Turning vehicles at these intersections, particularly L.H. turns, delay through movements due to restricted roadway width Mabel-College forms a north south route with a jog at Kathleen. Stop signs on Kathleen and College. Buses and L.H. turns delay other vehicles Various section of poor vertical alignment Melvin-MacKenzie form a north-south route with a jog at Kathleen: very poor visibility east of MacKenzie/Kathleen intersection. This combines with poor vertical alignments and minimum building setbacks to create hazardous conditions Poor horizontal alignment between MacKenzie and Brebent, with sharp curves, rock outcrops and minimum building setbacks all severely restricting sight distances Signalized Kathleen/Notre Dame intersection is complicated by entrance to food store parking lot as fourth (easterly) leg	Restricted visibility for westbound drivers at stop sign on Kathleen, at Regent/Kathleen/Frood intersection, particularly to the south
				ROUTE 15C BANCROFT DRIVE	
BANCROFT DRIVE From: Bellevue Ave. To: Kingsway	15C-1/2	5,850 feet	23-28 m.p.h.	Poor layout of Bancroft/Bellevue intersection. See also comments under Route 2B. Poor pavement definition, poorly located bus stops, gravel shoulders, poor horizontal and vertical alignments make the area dangerous for the many schoolchildren who frequent vicinity. Control of Bellevue approach with a stop sign appears illogical, because heavier movement is therefore yielding to lighter movement Narrow roadway, very poor horizontal alignment lined with rock faces makes this route most dangerous for walking schoolchildren, particularly at Lonsdale Unsatisfactory angle of intersection at Kingsway/ Bancroft intersection. Provision of turning lanes on Kingsway and greater regulation of fronting uses needed	
				ROUTE 16C SECOND AVENUE NORTH	
SECOND AVENUE NORTH From: Bancroft Dr. To: Kingsway	16C-1/2	5,780 feet	25-26 m.p.h.	Narrow roadway and shoulders with no curb or sidewalks. Considerable numbers of pedestrians generated by Nickel District College Poor visibility at hill south of Kingsway and very poorly aligned approach to Kingsway/Falconbridge intersection	
				ROUTE 17C MOONLIGHT AVENUE	
MOONLIGHT AVENUE From: Bancroft To: Kingsway	17C-1	3,230 feet	20-23 m.p.h.	Poor standards of this roadway and residential frontages make it unsuitable for the moderate to heavy traffic (including buses) which use it Steeply graded, poorly aligned northbound approach to Moonlight/Kingsway intersection	

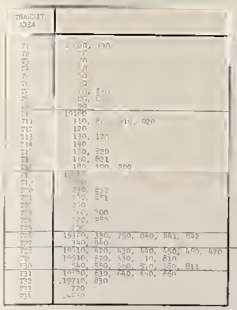
Speed and Delay Survey – Major Route Characteristics (continued)

STREET	SECTION	APPROX. LENGTH	AVERAGE SPEED	EASTBOUND/NORTHBOUND MOVEMENT	WESTBOUND/SOUTHBOUND MOVEMENT
ROUTE 18C LA SALLE BOULEVARD					
LA LLE BOULEVARD m: Notre Dame Ave. Barry-Downe Ave.	18C-1/4	10,070 feet	20-32 m.p.h.	2 lane, straight roadway with good vertical alignment Vehicles often observed to travel above posted 30 m.p.h. speed limit A considerable number of dangerous situations were observed along this route, including poor pavement deliniation; poor shoulders; pedestrians, school-children and mothers with baby carriages walking along narrow shoulders; intermittent lighting; poorly regulated and inadequately delinested driveways; and buildings too close to the roadway. Many of the side streets are unpaved and approach La Salle on an up-grade: hence, visibility is restricted. Altogether, in spite of the good alignment and speeds attained, this route was felt to be one of the most hazardous Turning vehicles at I.G.A. Food Market and New Sudbury Shopping Centre cause backing up and delays, suggesting the need for pavement widening and turning lanes Very heavy pedestrian movements across La Salle occurred between I.G.A. Food Market and Shopping Centre. Vehicle/pedestrian conflicts much in evidence La Salle/Barrydowne intersection controlled with stop signs on Barrydowne. Delays occurred here also	
LA LLE BOULEVARD m: Barrydowne Ave. Falconbridge Highway	18C-5/7	7,730 feet	24-30 m.p.h.	Continuation of some unsatisfactory features noted above Some delay caused by vehicles turning into Falcon Plaza shopping centre La Salle/Falconbridge intersection operating with 4-way stop signs at time of survey. Some widening of approaches here, but scarcely adequate	
LA LLE BOULEVARD m: Falconbridge Highway C.N.R. Station	18C-7/8	5,450 feet	22-24 m.p.h.	Pavement ends at Carmello Street becomes gravel-surfaced route, with severely restricted visibility due to very poor horizontal and vertical alignments. A "blind" hill followed by a sharp curve, occurs immediately east of Elisabella	
ROUTE 19C NORTHWAY AVENUE NOT SURVEYED					
ROUTE 20C BARRYDOWNE AVENUE					
BA DOWNE AVENUE m: Kingsway La Salle Blvd.	20C-1/2	7,170 feet	19-31 m.p.h.	2-lane roadway is narrow with fair to poor pavement surface, narrow shoulders, no widewalks, intermittent lighting Very narrow bridge at Junction Creek increases discomfort and hazard for pedestrians Poor vertical alignment at Hawthorne Drive and Junction Creek No pavement widening at New Sudbury Shopping Centre entrances, or at La Salle/Barrydowne Intersection. Delays encountered here Large unlighted concrete islands in entrances to Shopping Centre seem unnecessarily hazardous	Approach to Kingsway on moderately steep up-grade, with channelized R.H. turn controlled by yield sign
BA DOWNE AVENUE m: La Salle Blvd. Woodbine Ave.	20C-3	1,970 feet	20-22 m.p.h.	Pavement ends at Woodbine	
BA DOWNE AVENUE m: Woodbine Ave. Maley Dr.	20C-3	3,550 feet	24-25 m.p.h.	Poor vertical alignment just north of Woodbine - a "blind" hill Rough gravel roadway Irregular topography at Maley will require some work when traffic demand and development increase	
ROUTE 21C LANSING AVENUE NOT SURVEYED					

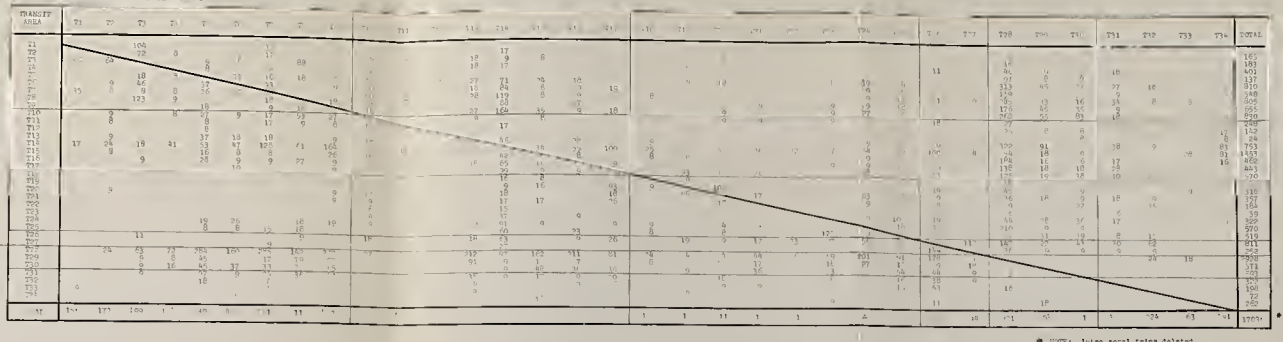
CITY OF SUDBURY ROADWAY STANDARDS

	THROUGH-WAY (T)	MAJOR HIGHWAY CONNECTION (A)	MINOR HIGHWAY CONNECTION (B)	ARTERIAL STREET (C)	COLLECTOR STREET (D)	LOCAL RESIDENTIAL CUL-DE-SAC MAX. 500' LONG (E)	LOCAL RESIDENTIAL STREET (E)	LOCAL INDUSTRIAL (E)
Right of Way Width		110' 150'	100'	86'-110	66'	66'	66'	66' with Storm Sewers
Number of Traffic Lanes		4-6	4	2-4	2	2	2	2
Width of Traffic Lanes		12'	11'-12'	2 x 12 4 x 11	12'	12'	11	15
Width of Parking Lane or Shoulder		Nil	Nil	Nil	10 feet Stopping Lane	Nil 4 feet for Pedestrians	One only 8 feet	2 x 10' Shoulder
Total Vehicular Street Width		48-72'	46'-48'	44'46'	34'	28'	30'	30 pavement & 2 x 10' Shoulder
Median Width		Median 6'-16	Nil	Parkway only	N/A	Nil	Nil	Nil
Design Speed		60	50	40-50 M.P.H. may be desirable	40	N/A	N/A	N/A
Access Control		Min of Cross Streets	Limited	Limited should be detailed	Zoning & Building By-Laws	One driveway opening per dwelling	One driveway per dwelling	Yield Sign where required
Traffic Controls		Signals & Channel-ization	Signals where warranted & Channel-ization	Signals where warranted & Channel-ization	Normal Warrants	Nil	Nil	Cross-Walk
Pedestrian Traffic Controls		Special Pedestrian Crossing where required	Cross-walks & Existing Signals	Cross-walks	Cross-walk	Nil	Cross-walk	Cross-walk
Maximum Grade		6%	6%	6%	8%	6%	10%	6%
Maximum Degree Horizontal Curve		6°	9°	9°	N/A	90' Turn-Around	N/A	N/A
Maximum Vertical Curvature		275' s.s.d. at 40 m.p.h. 350' s.s.d. at 50 m.p.h.	275 s.s.d. at 40 m.p.h.	200' s.s.d. at 30 m.p.h.	175' safe stopping distance	100' safe stopping distance	100' safe stopping distance	2% change in 30'
Minimum Corner Radius		Compound Curves 150'-50'-150'	35'	35'	30'	25'	25'	Compound Curves needed 35' Minimum
Sidewalks		None	Where Required	One-Side	One-Side	One-Side	One-Side	As Needed
Curb Design		Barrier Type	Barrier Type	Barrier Type	Barrier Type	Barrier Type	Barrier Type	Mountable Roll Type
Driveway Entrance		Limited	Limited	Limited should be detailed	Single 12' Double 20'	15' x 20'	15' x 20'	Special Considera-tions apply
Transit Service Accommodation		Bus-Bays or Turn-outs	Bus-Bays	Bus-Bays	Bus-Stops on Street	Nil	Nil	Bus-Bays or Drive-ins
Railway Crossing B. of T.C. Requirements		Underpass or Overpass	Signals Required	Signals Required	Signals Required	Do Not Cross	Do Not Cross	Signals Required
Load Restrictions Signs		None	None	None	None	No Heavy Trucks	No Heavy Trucks	None
Loading Facilities Commercial		Loading on Private Property Only	Loading on Private Property Only	Loading on Private Property Only	Loading Zones	Nil	Nil	All Loading on Private Property
Approach Grade at Intersecting Street		2% x 75'	2% x 75'	2% x 75'	2% x 30'	2% x 30' Maximum	2% x 30' Maximum	2% x 75'
Parking		None Allowed	None Allowed	None Allowed	None Allowed	None Allowed	No Parking Controls	No Parking Controls

(i) GROUPING OF O-D ZONES INTO TRANSIT AREAS



(ii) 1963 TRIP TABLE for INTERNAL BUS PASSENGER TRIPS



* NOTE: Intra-zonal trips deleted from the Trip Table

(iii) REPORTED BUS TRIPS by LAND USE and by WALKING DISTANCE

LAND USE AT DESTINATION | WALKING DISTANCE TO DESTINATION

	0	1	2	3	4	5	Over 5	Unk.
Residential (1)	6[illegible]	1582	892	30	252	-	1	
Commercial (2)	7387	969	423	376	117	1	134	-
Industrial (3)	241	15	19	22	0	-	2	
Public Buildings (4)	2348	215	374	269	186	137	167	[illegible]
Other (5, 6)	49	9	18	9	-	-	-	[illegible]
TOTAL	10045	2733	1996	1211	561	268	311	17385

(iv) REPORTED BUS TRIPS by PURPOSE TO and PURPOSE FROM

TRIP TO | TRIP FROM

	Home (1)	Work Business (2, 4)	Shopping (3)	School (4)	Social Recreational (5, 6)	Other (7, 8, 9)	TOTAL
Home (1)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Work Business (2, 4)	3[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	3[illegible]
Shopping (3)	[illegible]	[illegible]	[illegible]	-	[illegible]	-	[illegible]
School (4)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]
Social Recreational (5, 6)	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]
Other (7, 8, 9)	[illegible]	-	[illegible]	-	-	-	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]

(v) REPORTED BUS TRIPS by TRIP PURPOSE and by LAND USE

TRIP PURPOSE | LAND USE

	Residential (1)	Commercial (2)	Industrial (3)	Public Buildings (4)	Open Space (5)	Other (6)	TOTAL
Home (1)	[illegible]	[illegible]	-	[illegible]	-	-	[illegible]
Work (2)	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]
Shopping (3)	-	[illegible]	9	-	-	-	[illegible]
School (4)	-	[illegible]	-	[illegible]	-	-	[illegible]
Social/ Recreational (5)	[illegible]	[illegible]	-	[illegible]	[illegible]	-	[illegible]
Eat Meal (6)	[illegible]	[illegible]	-	-	-	-	[illegible]
Business (7)	[illegible]	[illegible]	-	[illegible]	-	-	[illegible]
Change Mode (8)	[illegible]	[illegible]	-	[illegible]	-	[illegible]	[illegible]
Misc (9)	-	-	-	-	-	-	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CHARACTERISTICS OF TRANSIT TRIPS

SEPT./OCT. 1963

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT A-K

SCHEDULE OF PROJECTS STUDIED

STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH Present	PAVEMENT WIDTH Future	DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
ROUTE 1T								
LORNE STREET SOUTH BRADY STREET (Expressway)	Horobin St. Douglas St.	1T-1	3100'	42'	48'	Grade Separate C.P.R. Construct new road and interchange	Recommended Stage I	8.O,8.C, 8.G
BRADY STREET (Expressway)	Douglas St. Drinkwater St.	1T-2	3400'	-	48'	Control access Construct new inter-change	Recommended Stage I	8.D,8.H
BRADY STREET EXTENSION (Expressway)	Drinkwater St. Kingsway/Argyle	1T-3	2700'	-	48'	Construct new road and interchange	Recommended Stage II	8.D,8.J
ROUTE 2T								
BRADY STREET EXTENSION (Expressway)	Drinkwater St. Kingsway/Falconbr.	2T-1	14500'	-	48'	Construct new con-trolled access road	Not Recommended	9.A
ROUTE 3T								
BRADY STREET EXTENSION (Expressway)	Drinkwater St. Kingsway/Bancroft	3T-1	7200'	-	48'	Construct new con-trolled access road	Not Recommended	7.A

STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH Present	PAVEMENT WIDTH Future	DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
ROUTE 1A								
HIGHWAY 17 LORNE STREET SOUTH (Major Arterial)	W. City Limits Kelley Lake Rd.	1A-1	4900'	41'	41'	Maintain with minor improvements	-	8.A
LORNE STREET SOUTH (Major Arterial)	Kelley Lake Rd. Horobin St.	1A-2/4	7000'	41'	72'	Widen and improve	Recommended Stage II	8.A,8.C
LORNE STREET SOUTH BRADY STREET (Expressway)	Horobin St. Douglas St.	1A-5/6	3100'	42'	48'	Refer to Section 1T-1		8.O,8.A 8.G
LORNE STREET SOUTH (Major Arterial)	Douglas St. Alder St.	1A-7	600'	40'	72'	Widen and improve	Recommended Stage II	8.C,8.E
LORNE STREET SOUTH (Arterial)	Alder St. Elm St. W.	1A-8/10	2800'	40'	48'	Widen and improve	Recommended Stage III	8.E
ELM STREET W. AND E. (Arterial)	Lorne St. Lisgar St.	1A-11/13	1900'	42'	42'	Maintain	-	8.D,8.E
ELM STREET EAST LLOYD STREET (Arterial)	Lisgar St. Carleton St.	1A-14/16	2000'	36'	48'	Widen and improve	Recommended Stage II	8.D II
LLOYD STREET KINGSWAY (Arterial)	Carleton St. Argyle St.	1A-17	800'	36'	48'	Refer to Section 1T-3		8.D,8.J
KINGSWAY (Major Arterial)	Argyle St. Old City Limits	1A-18	1500'	36'	a)48' b)72'	a) Widen and improve b) Further widening	Recommended a) Stage II b) Stage IV	8.D
KINGSWAY (Major Arterial)	Old City Limits Falconbridge Rd.	1A-19/21	10000'	38'	72'	Widen and improve intersections	Recommended Stage IV	8.A
KINGSWAY (Major Arterial)	Falconbridge Rd. Moonlight Ave.	1A-22/25	10600'	24'	48'	Widen and improve	Recommended Stage IV	8.A
KINGSWAY HIGHWAY 17 (Major Arterial)	Moonlight Ave. E. City Limits	1A-26/27	4000'	24'	48'	Widen and improve	Recommended Stage IV	8.A
ROUTE 2A								
HIGHWAY 69 REGENT STREET SOUTH (Major Arterial)	S. City Limits Paris St.	2A-1	3600'	26'	48'	Widen and improve	Recommended Stage III	8.A
REGENT STREET SOUTH (Major Arterial)	Paris St. Walford Rd.	2A-2/3	5100'	24'	48'	Widen and improve	Recommended Stage I	8.A
REGENT STREET SOUTH (Major Arterial)	Walford Rd. York St.	2A-4	4300'	48'	48'	Under construction	-	8.A
REGENT STREET SOUTH (Major Arterial)	York St. Wembley Dr.	2A-5/6	1500'	40'	72'	Widen and improve	Recommended Stage II	8.C
ROUTE 3A								
ONTARIO STREET (Local)	Martindale Rd. McLeod St.	3A-1	1000'	42'	42'	Revert to local street when new C.P.R. cross-ing opens	-	8.C
McLEOD STREET (Major Arterial)	Ontario St. Regent St. S.	3A-2	1800'	42'	46'	Widen and improve with new C.P.R. crossing	Recommended Stage I	8.C
ROUTE 4A								
NEW ROUTE (SOUTH WEST BYPASS) (Arterial)	Hwy.17/Kelley Lake Rd. Hwy.69/Paris St.	4A-1	-	-	24'	Construct new road south of Kelley Lake	Not Recommended	7.A
ROUTE 5A								
YORK STREET EXTENSION (Arterial)	Lorne St. S. Regent St. S.	5A-1	-	-	46'	Construct new road across Junction Creek	Not Recommended	9.A

Schedule of Projects Studied (continued)

STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH Present	PAVEMENT WIDTH Future	DESCRIPTION OF WORK	RECOMMENDATION	EXHIB.
ROUTE 1B								
LEVACK ROAD (Major Arterial)	W. City Limits Clarabelle Rd.	1B-1/2	11600'	23'	23'	Maintain	-	8.A
LEVACK ROAD (Major Arterial)	Clarabelle Rd. Fisher Plant	1B-3/5	6800'	23'	48'	Widen and improve with new C.P.R. bridge	Recommended Stage IV	8.A
LEVACK ROAD SPRUCE STREET (Major Arterial)	Fisher Plant Elm/Albinson	1B-6/9	4800'	23'	48'	Widen and improve with new Spruce/Elm connection	Not Recommended	9.A
LEVACK ROAD ELM STREET WEST (Major Arterial)	Fisher Plant Elm/Albinson	1B-6/9	3400'	-	48'	Construct new road through rock and widen Elm	Recommended Stage III	8.A
ELM STREET WEST (Major Arterial)	Albinson St. Alder St.	1B-10/11	1600'	42'	48'	Widen and improve	Recommended Stage II	8A, 8E
ELM STREET WEST (Arterial)	Alder St. Lorne St.	1B-12/13	1100'	42'	44'	Maintain with minor improvements, remove parking	-	8.E
LORNE STREET NORTH (Arterial)	Elm St. W. Frood Rd.	1B-14	700'	40'	46'	Widen roadway and C.P.R. Underpass	Recommended Stage IV	8.E
ROUTE 2B								
ELGIN STREET N. AND S. (Arterial)	Beech St. Van Horne/Minto	2B-1/4	2900'	43'-36'	46'	Maintain or construct new connection to Frood	-	8.D, 8
ELGIN STREET SOUTH (Arterial)	Van Horne/Minto Nelson/Lourdes/ Morris	2B-5/6	1700'	36'	44'	Reconstruct to underpass new Paris/ Drinkwater Road	Recommended Stage III	8.D, 8
MORRIS STREET HOWEY DRIVE (Arterial)	Nelson/Lourdes/ Elgin Bellevue Ave.	2B-7/12	8500'	30'-22'	46'	Widen and improve Howey/Bellevue corner	Recommended Stage III	8.A
BELLEVUE AVENUE (Arterial)	Howey Dr. Bancroft Dr.	2B-13	2400'	23'	46'	Widen and improve Bellevue/Bancroft intersection	Recommended Stage IV	8.A
BANCROFT DRIVE (Arterial)	Bellevue Ave. Second Ave.	2B-14/15	3800'	22'	46'	Widen and improve	Recommended Stage IV	8.A
BANCROFT DRIVE (Arterial)	Second Ave. E. City Limits	2B-16/21	11900'	22'	24'	Maintain	-	8.A
ROUTE 3B								
FALCONBRIDGE ROAD (Major Arterial)	Kingsway Churchill Ave.	3B-1	1700'	22'	48'	Widen and improve Churchill intersection	Recommended Stage II	8.A
FALCONBRIDGE ROAD (Major Arterial)	Churchill Ave. La Salle Blvd.	3B-2/5	6200'	22'	48'	Widen and improve La Salle intersection	Recommended Stage III	8.A
FALCONBRIDGE ROAD HIGHWAY 541 (Major Arterial)	La Salle Blvd. Maley Dr. (N. City Limits)	3B-5/8	6200'	22'	48'	Widen and improve intersections	Recommended Stage IV	8.A
ROUTE 4B								
DURHAM STREET (Collector)	Elgin St. S. Beech St.	4B-1/2	1600'	42'	42'	Maintain if required for downtown plan	-	8.D, 8
ROUTE 5B								
PINE STREET (Major Arterial)	Alder St. Lorne St.	5B-0	1100'	42'	48'	Widen and improve remove parking	Recommended Stage II	8.E, 8 8.K
PINE STREET BEECH STREET (Major Arterial)	Lorne St. Notre Dame Ave.	5B-1	1800'	40'	48'	Widen with new C.P.R. underpass	Recommended Stage II	8.F, 8
NOTRE DAME AVENUE (Major Arterial)	Beech St. Kathleen St.	5B-2/4	3400'	36'	72'	Widen and improve intersections	Recommended Stage I	8.F
NOTRE DAME AVENUE (Major Arterial)	Kathleen St. Wilma St.	5B-4/5	2200'	36'	48'	Widen and improve close minor streets	Recommended Stage I	8.F
NOTRE DAME AVENUE (Major Arterial)	Wilma St. La Salle Blvd.	5B-6/7	5500'	48'	48'	Maintain	-	8.A
NOTRE DAME AVENUE HIGHWAY 69 (Major Arterial)	La Salle Blvd. City Limits	5B-8/9	5600'	24'	48'	Widen and improve	Recommended Stage IV	8.A
ROUTE 6B								
FROOD ROAD (Arterial)	Elgin St. Elm St.	6B-0	600'	-	46'	May construct new connection	-	8.E
FROOD ROAD (Arterial)	Elm St. College St.	6B-1	500'	43'	46'	Reconstruct to overpass Pine-Beech	Recommended Stage II	8.E
FROOD ROAD (Arterial)	College St. Frood Mine	6B-2/6	14300'	41'-21½'	46'	Widen and improve intersections	Recommended Stage III	8.A
TURNER AVENUE (Arterial)	Frood Mine Notre Dame Ave.	6B-7/8	4600'	20'	24'	Maintain and improve	-	8.A
ROUTE 7B								
NEW ROUTE VIA AGNES STREET (Major Arterial)	Notre Dame/Kathleen Queen St.	7B-1	1900'	-	46'	Construct new road crossing C.N.R.	Recommended Stage II	8.A, 8
NEW ROUTE SOUTH OF C.N.R. (Major Arterial)	Queen St. Extended Attlee St.	7B-2	7900'	-	(a)24' (b)48'	a) Construct new road b) Widen and improve	a) Stage II b) Stage IV	8.A
GEMMELL STREET (Major Arterial)	Extended Attlee St. Barrydowne Ave.	7B-3	2500'	-	48'	Widen and improve	Recommended Stage III	8.A

EXHIBIT
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Schedule of Projects Studied (continued)

STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH		DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
				Present	Future			
ROUTE 8B								
NEW ROAD (Major Arterial)	Notre Dame/Wilma Barrydowne Rd.	8B-1	11800'	-	48'	Construct new road North of C.N.R.	Not Recommended	9.A
ROUTE 9B								
NEW ROAD (Major Arterial)	Frood/Lorne Notre Dame/Louis Louis Notre Dame Ave.	9B-1	2000'	-	48'	Construct new road North of Churches	Not Recommended	7.A
ROUTE 10B								
ALDER STREET (Major Arterial)	Lorne St. Ash St.	10B-1	2800'	28'	46'	Widen and improve	Recommended Stage II	8.E
NEW ROUTE (Major Arterial)	Alder/Ash Kathleen/College	10B-2	2300'	-	46'	Construct new viaduct over C.P.R., Nolin Creek and Frood	Recommended Stage II	8.L
NEW ROUTE (Major Arterial)	Alder/Ash Kathleen/College	10B-2			46'	Various alternative alignments	Not Recommended	9.A
KATHLEEN STREET (Major Arterial)	College St. Notre Dame Ave.	14C-3/4	3400'	30'	46'	Widen and improve	Recommended Stage II	8.E, 8.F
ROUTE 11B								
NEW ROUTE (Arterial)	Clarabelle/Levack Frood Rd.	11B-1	12600'	-	46'	Construct new road	Not Recommended	7.A
NEW ROUTE (Arterial)	Frood Rd. Notre Dame/La Salle	11B-2	5900'	-	46'	Construct new road	Not Recommended	7.A

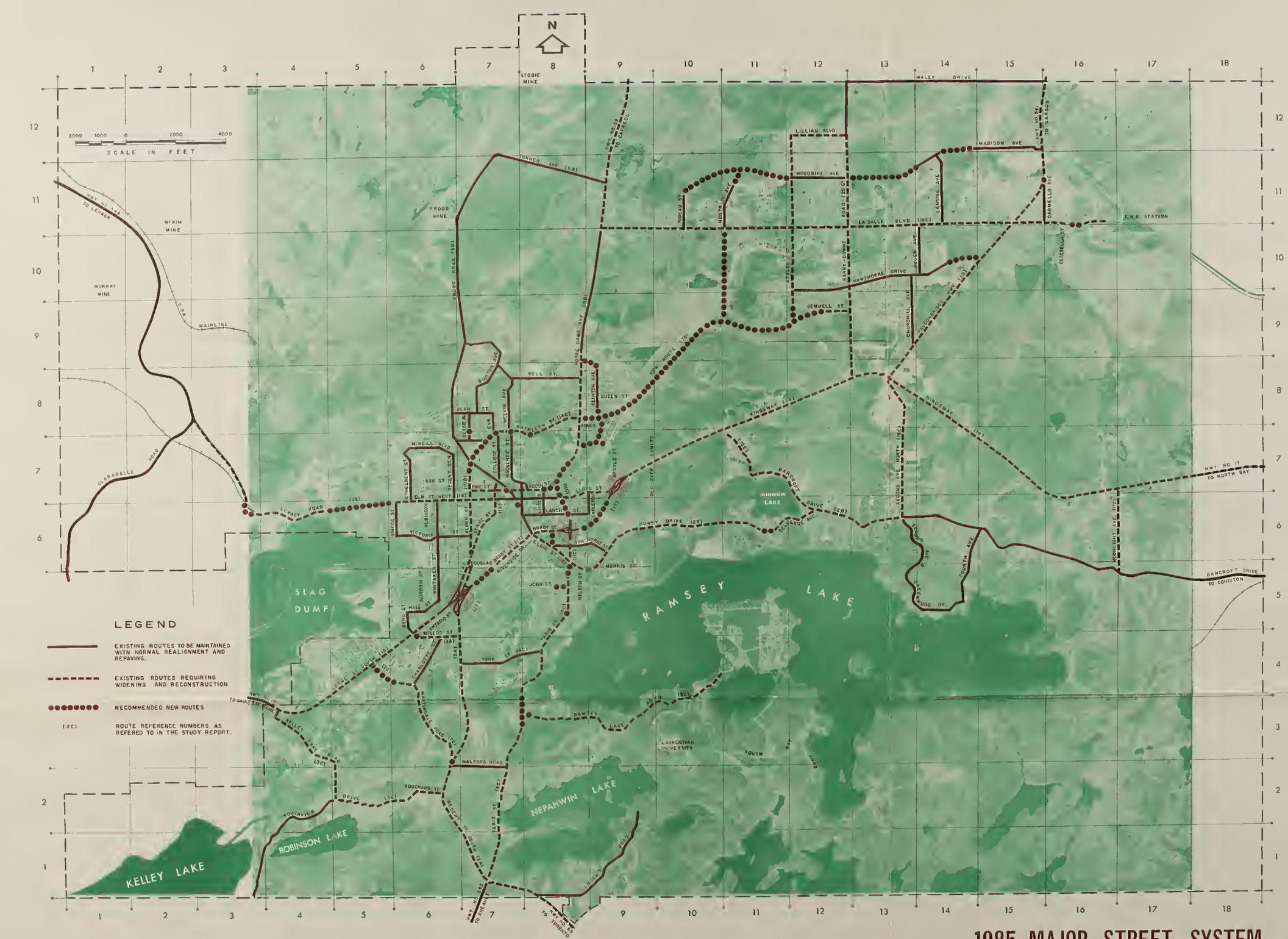
STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH		DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
				Present	Future			
ROUTE 1C								
REGENT STREET S. AND N. (Local)	Lorne St. S. Kathleen St.	1C-1/5	6500'	30'-36'	34'	Revert to Local or Collector Street	-	8.E
ROUTE 2C								
MARTINDALE ROAD (Collector)	Regent St. S. Copper St.	2C-1/3	4500'	22'-34'	34'	Maintain and improve Regent/Walford Intersection	-	8.A
MARTINDALE ROAD (Collector)	Copper St. Lorne St. S.	2C-4	1500'	44'	34'	Construct new road and C.P.R. crossing	Recommended Stage II	8.C
ROUTE 3C								
KELLEY LAKE ROAD, SOUTHVIEW DRIVE BOUCHARD STREET (Arterial)	Lorne St. Regent St.	3C-1/5	10100'	21'	46'	Widen and improve	Recommended Stage IV	8.A
ROUTES 4C, 11C								
PARIS STREET (Major Arterial)	Regent St. S. Walford Rd.	4C-1/3	4600'	20'	44'	Widen and improve	Recommended Stage I	8.A
PARIS STREET (Major Arterial)	Walford Rd. John St.	4C-4/9	8700'	20'	46'	Widen and improve	Recommended Stage II	8.A, 8.D
JOHN STREET NELSON STREET (Collector)	Paris St. Elgin/Morris/Lourdes	4C-10/11	1300'	30'	30'	Maintain and revert to collector	-	8.D
PARIS STREET DRINKWATER STREET (Major Arterial)	John St. Van Horne St.	11C-0/1	1700'	30'	48'	Construct new overpass across C.P.R. yards and Elgin	Recommended Stage III	8.K
DRINKWATER STREET (Major Arterial)	Van Horne St. Larch St.	11C-2	1300'	34'	72'	Refer to Section 1T-2		8.H
DRINKWATER STREET NEW ROAD (Major Arterial)	Larch St. Notre Dame/Beech	11C-3	1800'	34'	72'	Construct new road intersecting Elm	Recommended Stage II	8.D
ROUTE 5C								
RAMSEY LAKE ROAD (Collector)	Paris St. Southbay Rd.	5C-1	8200'	21'	34'	Widen and improve	Recommended Stage I	8.A
RAMSEY LAKE ROAD (Collector)	Southbay Rd. End	5C-2	4300'	-	34'	Maintain and improve as needed	-	8.A
ROUTE 6C								
YORK STREET (Collector)	Regent St. S. Paris St.	6C-1/2	3200'	36'	36'	Maintain and improve as needed	-	8.A, 8.C
ROUTE 7C								
ONTARIO STREET (Collector)	McLeod St. Regent St. S.	7C-1	2300'	42'	42'	Revert to Local Street when interchange 17-1 is built	-	8.C, 8.G
ROUTE 8C								
RIVERSIDE DRIVE (Collector)	Regent St. S. End	8C-1/2	3800'	36'	36'	Integrate with other collectors when 1T-1 is built	-	8.G

Schedule of Projects Studied (continued)

STREET (CLASSIFICATION)	FROM: TO:	SECTION	LENGTH	PAVEMENT WIDTH		DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
				Present	Future			
ROUTE 9C								
DOUGLAS STREET (Collector)	Regent St. Brady St.	9C-1	1600'	34'	34'	Close at Brady when expressway 1T-1 is built	-	8.G
ROUTE 10C								
MINTO STREET (Collector)	Elgin St. Larch St.	10C-1	1300'	41'	-	Close	-	8.D, 8.H
ROUTE 11C								
DRINKWATER STREET (Major Arterial)	Elgin St. Notre Dame/Beech	11C-0/3	1900'	-	-	Refer to comments under Route 4C		8.D, 8.H 8.K
ROUTE 12C								
CEDAR STREET (Local)	Elgin St. Carleton St.	12C-1	2700'	42'	42'	Close at new Drinkwater extension 11C-3	-	8.D
ROUTE 13C								
LISGAR STREET (Collector)	Larch St. Beech St.	13C-1	1100'	44'	44'	Maintain and improve intersections	-	8.D
ROUTE 14C								
KATHLEEN STREET (Local)	Frood Rd. College St.	14C-1/2	1800'	40'	40'	Close at C.N.R. and revert to local street	-	8.E, 8.L
KATHLEEN STREET (Major Arterial)	College St. Notre Dame Ave.	14C-3/4	3400'	30'	46'	Widen and improve See also Route 10B	Recommended Stage II	8.E, 8.F
ROUTE 15C								
BANCROFT DRIVE (Arterial)	Bellevue Ave. Kingsway	15C-1/2	5600'	22'	44'	Widen and improve	Recommended Stage I	8.A
ROUTE 16C								
SECOND AVENUE (Arterial)	Bancroft Dr. Kingsway	16C-1/3	5700'	24'	44'	Widen and improve	Recommended Stage IV	8.A
ROUTE 17C								
MOONLIGHT AVENUE (Collector)	Bancroft Dr. Kingsway	17C-1	3300'	20'	34'	Pave, widen and improve	Recommended Stage III	8.A
ROUTE 18C								
LA SALLE BOULEVARD (Major Arterial)	Notre Dame Ave. Barrydowne Rd.	18C-1/4	10100	24'	48'	Widen and improve	Recommended Stage I	8.A
LA SALLE BOULEVARD (Major Arterial)	Barrydowne Rd. Falconbridge Rd.	18C-5/6	6600'	24'	48'	Widen and improve	Recommended Stage III	8.A
LA SALLE BOULEVARD (Collector)	Falconbridge Rd. C.N.R. Station	18C-7/8	5400'	21'	34'	Maintain and improve as required	-	8.A
ROUTE 19C								
NORTHWAY STREET (Collector)	La Salle Blvd. End	19C-1	1000'	19'	34'	Revert to Local Street	-	8.A
ROUTE 20C								
BARRYDOWNE ROAD (Major Arterial)	Kingsway La Salle Blvd.	20C-1/2	6100'	22'	48'	Widen and improve	Recommended Stage I	8.A
BARRYDOWNE ROAD (Collector)	La Salle Blvd. Woodbine Ave.	20C-3	2100'	22'	34'	Widen and improve	Recommended Stage III	8.A
BARRYDOWNE ROAD MALEY DRIVE (Collector)	Woodbine Ave. Highway 541	20C-4	11500	22'	34'	Maintain and improve	-	8.A
ROUTE 21C								
LANSING AVENUE (Collector)	La Salle Blvd. Madison Ave.	21C-1	2800'	21'	34'	Maintain and improve	-	8.A
ROUTE 22C								
NEW ROAD VIA RAMSEY CREEK (Arterial)	Kelley Lake Rd./ Lorne Paris St.	22C-1	9800'	-	24'	Construct new road	Not Recommended	7.A
ROUTE 23C								
NEW ROUTE S.E. OF RAMSEY LAKE (Arterial)	Regent St. S./Hunter Kingsway	23C-1	32700'	-	24'	Construct new road	Not Recommended	7.A

Schedule of Projects Studied (continued)

COMMUNITY	LOCATION	REF.	DESCRIPTION OF WORK	RECOMMENDATION	EXHIBITS
PIKE LAKE (Neighbourhood 1)	S. of Ramsey Lake N. and E. of Nepahwin Lake	D-1	Improve collector streets as required	-	8.A
LOCKERBY EAST (Neighbourhoods 2,3)	E. of Regent St. (Highway 69) S. of Ramsey Creek	D-2	Improve collector streets as required	-	8.A
LOCKERBY WEST (Neighbourhoods 4,5)	W. of Regent St. (Highway 69)	D-3	Improve collector streets as required	-	8.A
LAKEVIEW-KINGSMOUNT (Neighbourhoods 6,7)	N. of Ramsey Creek S. of C.P.R. Facilities E. of Regent St. (Highway 69)	D-4	Improve collector streets, construct John to Marion	Recommended Stage I or II	8.C. 8.D
GATCHELL (Neighbourhood 8)	N. of Lorne St. (Highway 17) W. of Byng St.	D-5	Improve collectors close local street at Lorne	-	8.A
WEST END (Neighbourhoods 9,10,11,12)	N. of Lorne St. (Highway 17) S. of C.P.R. Tracks E. of Town of Copper Cliff	D-6	Improve collector streets as required	-	8.C. 8.E
DONOVAN (Neighbourhoods 13,14,15)	N. of C.P.R. and Beech St. W. of Notre Dame Ave.	D-7	Improve collector streets, remove jogs at Kathleen	Recommended Stage I or II	8.E. 8.F
FLOUR MILL (Neighbourhood 16)	E. of Notre Dame Ave. N. of Louis St. S. of C.P.R. Tracks	D-8	Improve collector streets and make new connections	Recommended Stage I or II	8.E
NORTHERN HEIGHTS (Neighbourhoods 17,18)	E. of Frood Rd. W. of Notre Dame Ave. N. of Donovan Area	D-9	Maintain and improve collector streets	-	8.A
NEW SUDBURY WEST (Neighbourhoods 19,20,21)	N. of C.N.R. Tracks E. of Notre Dame Ave. W. of Barrydowne Rd. and Shopping Centre	D-10	Develop and maintain collector streets	-	8.A
NEW SUDBURY EAST (Neighbourhoods 22,23)	N. of La Salle Blvd. E. of Barrydowne Rd.	D-11	Develop and maintain collector streets	-	8.A
NEW SUDBURY SOUTH (Neighbourhoods 24,25)	S. of C.N.R. Tracks	D-12	Develop and maintain collector streets	-	8.A
HOWEY-KINGSWAY (Neighbourhoods 26,27,28)	E. of Downtown	D-13	Improve Van Horne	Recommended Stage I or II	8.A
MINNOW LAKE WEST (Neighbourhoods 29,30,31)	W. of First Ave.	D-14	Develop collector streets as required	-	8.A
MINNOW LAKE EAST (MOONLIGHT) (Neighbourhoods 32,33,34)	E. of First Ave.	D-15	Maintain and improve collector streets	-	8.A
DOWNTOWN		D-16	Designate access and circulation plan	-	8.D. 8.E



1985 MAJOR STREET SYSTEM

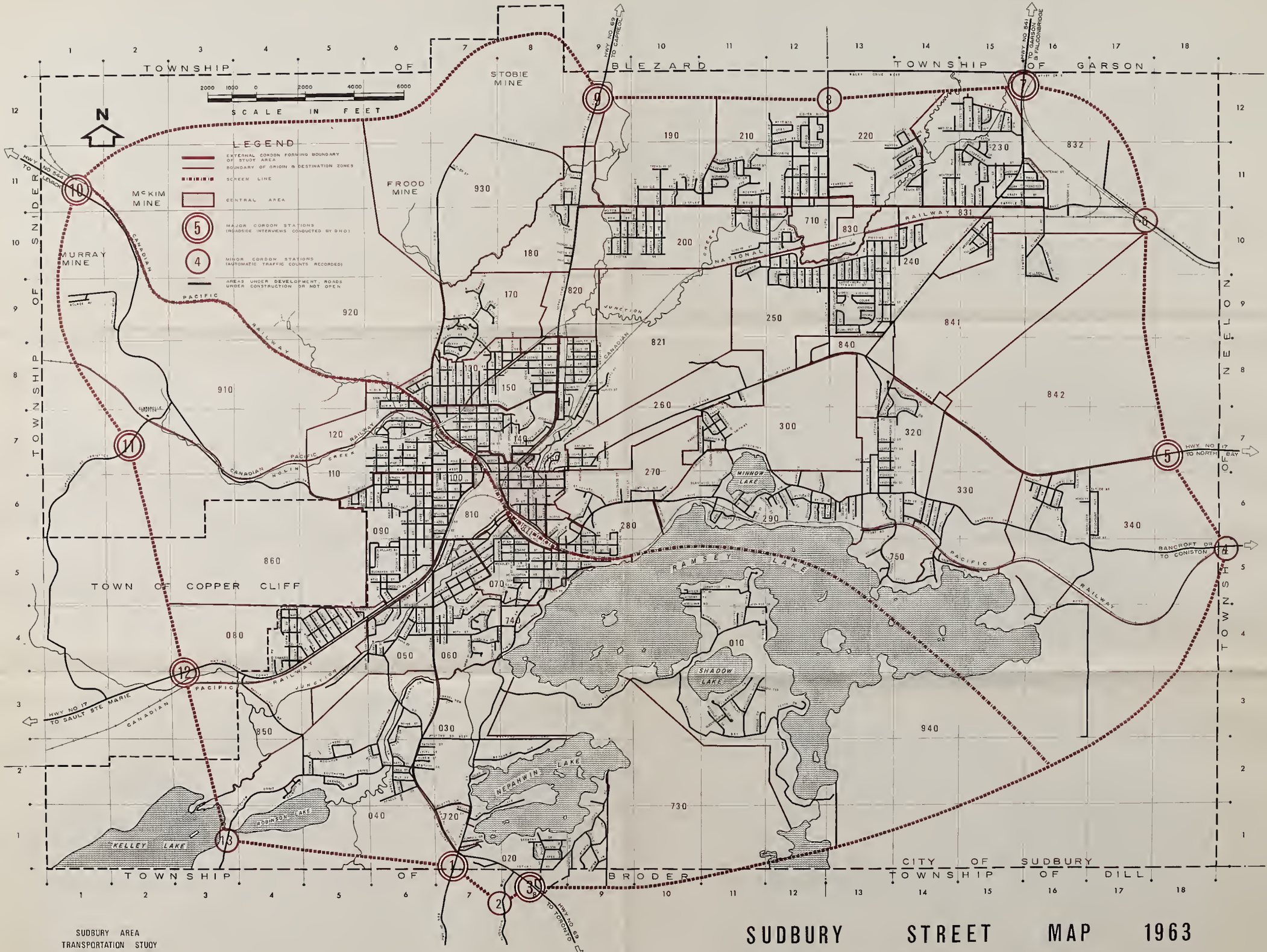
AS PROPOSED BY THE

RECOMMENDED PLAN

SUDBURY AREA TRANSPORTATION STUDY

DILLON

EXHIBIT O. A



SUDBURY AREA TRANSPORTATION STUDY

DILLON

SUDBURY STREET MAP 1963

SHOWING ORIGIN AND DESTINATION ZONES

EXHIBIT 0-0